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Psychedemic of mental health problems and COVID-19: Are we doing enough?

As India and the world reels under the second and the third waves of COVID-19, there runs parallelly a "psychedemic," i.e. the mental health aspect of the pandemic, which seems to get side-stepped in the rush of massive caseloads and deaths. The sheer size of the pandemic would translate into a high burden of mental health disorders. However, in the present situation, the here and now of survival garners all the effort, and mental health takes a backseat. Nobody is counting the mental morbidity and the impact thereof except for what one can find in the registers of the helpline numbers and the pages of scientific journals. It is not that mental health is facing total neglect. The World Health Organization (WHO) and the Ministry of Health and Family Welfare, Government of India (MOHFW) have acknowledged from the beginning of the pandemic the requirement of mental health needs of the people and the health-care workers (HCWs) and have continued to do their bit to deal with this large problem. However, is it enough? It may be too little and too fragmented to make much impact.

The SARS-CoV-2 causes varied mental health problems among patients and their families, HCWs, and the general population ranging from organic disorders, worsening of the existing disorders, substance abuse, psychological stress, anxiety, depression, sleep disturbances, posttraumatic stress disorder (PTSD) to suicide in varying proportions.[1] Multiple mechanisms are involved in the causation of such disorders among the COVID-19 patients, from neuroinflammatory pathway causing neuropsychiatric manifestations such as psychosis, relapse or exacerbation of already existing disorders due to interruption in the treatment as a consequence of lockdowns, psychological effects of isolation, or PTSD due to severe disease.[2] Among the HCWs, fear of getting infected or infecting one's family members, burnout, having to stay away from the family, psychological, and social stress due to helpless witnessing of enumerable death and suffering, getting stigmatized, quarantine, isolation, and losing close associates to COVID-19 would all contribute to mental health problems.[2] In the general population, besides quarantine, witnessing severe disease and death of one or more loved ones within the family, fear of getting infected, social stress of unemployment, lack of earning and ostracising of the family if any member became positive, and the inability to venture out and stay indoors for a long duration due to lockdowns have all been instrumental in causing mental health problems. Added to the burden is the large number of children orphaned by the pandemic, who will have their own set of psychological disorders that can jeopardize their future. Any plan to rehabilitate them has to take into account their mental health needs.

This psychedemic of mental health problems which is striking against the shores of humanity is obscured at present by the imagery of gasping patients and bundled bodies. However, it will eventually rear its ugly head and the ramifications will be both visible in terms of high morbidity and mortality and invisible in terms of negative impact on the country's socioeconomic development. Therefore, it is vital that we recognize the gravity now and implement measures to mitigate the mental health effects of COVID-19. A look at what exists already shows that plenty of documents exist on the government and nongovernmental organizations' websites to help people and HCWs deal with their own and the patients' mental health problems. However, in a country like India, how many people can have access to those documents? How many health workers will have the time and energy to search multiple websites and download those documents or watch the videos? Not undermining the importance of these materials to help people, we must also accept that these have their limitations. When a person is under severe depression or are suicidal, they do not have the inclination to search nor use these resources. Therefore, the useful approach under such circumstances, i.e., 24 × 7 helpline numbers and telepsychiatry facilities are being provided by many agencies in the country including MOHFW. There is no arguing that these helpline numbers would have saved many lives and improved others. However, we must acknowledge that the reach of these helpline and telepsychiatry numbers and the self-help material would be mainly catering to the educated and the urban populations. That the rural and low literacy populations would be excluded with these strategies is only part of the problem. There are other issues with mental health in India; people have low mental health literacy,

resulting in the inability to recognize the symptoms of psychological stress or disorder and hence fail to seek help, and where they recognize, it may cause added fear of stigma and make them more stressed.[3] Hence, in a sociodemographically diverse population like India, there must be a multipronged, well-planned, systematic approach to be of substantial benefit to the people.

COVID-19 has seriously affected the population's mental health, and this effect will continue in the aftermath of the pandemic. There is need to take care of the mental health-care needs of the people beyond the currently existing strategies in terms of both coverage and repertoire of services. The strategy must include short-term measures for the pressing needs and long-term plans. In the short term, with limited resources, effort should be made to maximize the utility of the already existing ones. Currently, the helpline numbers, telepsychiatry, and capacity strengthening activity for HCWs are mostly working in silos. There is a need to integrate these activities. The telepsychiatry network must reach spatially and socioeconomically remote populations. The National Mental Health Program (NMHP) should be strengthened whereby its network is used as a platform to create a system of an all-pervasive telepsychiatry facility, should be linked with the 24 × 7 helpline numbers. Mental health care should be part of the management package for all COVID-19 patients including postdischarge continuity of care for severe cases. A mechanism should be in place for active intervention for HCWs as they may not get the time, energy, nor inclination to seek active care. Ideally, every hospital should have a team to look after the mental health of their staff. They should also be made aware of existence of such a team and various means of approaching them, should the need arise. However, it will not be possible for every hospital or peripheral health institutions (PHI) to have a team to look after the mental health of their HCWs, and this gap can be filled by a common pool catering to geographically proximate PHIs and hospitals.

The community mental health component should be strengthened using the stepped care model proposed by the WHO with country-specific modifications.[4] The grass root level workers such as the Accredited Social Health Activist, auxiliary nurse-midwife, and male health workers should be trained to recognize the symptoms of mental illness, including substance abuse, and refer them. Given the shortage of psychiatrists in the country, the MBBS doctors in the primary health centers or other specialists in the Community Health Center, Subdistrict Hospital or a District Hospital can be trained in the short course of community mental health in the lines of what was done for the training of surgeons for cesarean section and anesthesia to reduce maternal mortality.[3] These PHIs are supposed to have a trained counsellor under the National Programme for the Prevention and Control of Cancer, Diabetes, Cardiovascular disease, and Stroke Programme for noncommunicable disease patients. Integration can happen at this level with the same workforce being used for mental health care. With a counsellor and a doctor trained in mental health in the PHIs, a vast majority of cases can be solved within the district. Only severe and challenging cases may be referred. In this way, mental health services will be within reach of the people. In the absence of a doctor trained in mental health, the telepsychiatry facility may be used. Meanwhile, there should be more aggressive advocacy and communication strategies to remove the stigma and encourage people to seek help when needed.

Long-term measures are well elucidated in the NMHP, but they must be followed in letter and spirit if mental health care is to be made effective and widely available. The number of postgraduate seats in psychiatry should be increased. Besides psychiatrists, there is a severe shortage of other mental health professionals such as clinical psychologists, psychiatric nurses, and psychiatric social workers. These courses should be made available in all the medical colleges. There should be a strong forward and back referral of cases so that patients can continue their treatment through the primary care physicians once the treatment is started and titrated at the secondary or tertiary care levels. There should be good record linkage between the specialists and primary care physicians. Eventually, all the best-planned programs can be nullified by the lack of adequate budget allocation, and the best budget may not yield the desired results in the absence of a systematic monitoring and evaluation system. These could be the Achilles heels of NMHP unless remedial measures are taken at relevant levels.

COVID-19 took the world and India by surprise this time. It has caused substantial morbidity and mortality despite modern medicine and all its benefits, like accelerated vaccine production. Mental health disorders related to COVID-19 have been varied in manifestations and burden has been high, but it has not received the attention it warrants. As history has shown, we cannot avoid epidemics and pandemics altogether. With the implementation of short-term measures, we can still hope to mitigate the mental health impact of this pandemic and with effective implementation of long-term measures, the potential

future pandemics should be less devastating mentally than this time.

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Perspective

Global child health: What are the threats our children are facing?

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Abstract

Disparities across the world are widening day by day. Children are the most vulnerable population impacted by the disparities. As governments and civil societies are successfully tackling traditional threats to children such as malnutrition, infectious diseases, and inadequate neonatal care, newer threats such as climate change, child trafficking, and childhood obesity are emerging. Threats like the COVID-19 pandemic, although not directly impacting children's health, have caused a significant effect on the delivery of child health services. The present article examines the current and future threats faced by children worldwide and offers solutions to mitigate those threats.

Keywords: Child health, global health, pediatric

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INTRODUCTION

A 1-year-old girl was born premature and had low birth weight. She has had frequent episodes of pneumonia and diarrhea during her infancy, and she is severely malnourished. Her parents are farm laborers in the Rajasthan state of India. Her mother took a day off from work to get her vaccinated against measles. However, she was turned back at the community health center as there was a shortage of measles vaccine supplies due to the COVID19 pandemic. If she develops measles, her chance of survival is slim. Rajasthan has one of the highest infant and under-5 mortalities in India. There are millions of children like her across the world who are unable to get essential health care due to the COVID19 catastrophe and other reasons unrelated to the pandemic. They face an existential threat from old and newly emerging challenges alike.

The United Nations (UN) convention on the "Rights of the Child" was adopted in 1989 and is the most widely ratified treaty in human rights.[1] The treaty has been approved by all UN member states except the USA. The convention states that childhood lasts until 18 years and is different from adulthood, and all children have the right to grow, learn, play, develop, and flourish with dignity.[1] If we need to fulfill the ambitious goals of the "Rights of the Child" convention, we need to identify and neutralize the threats that can stop us from achieving these goals.

There is gross inequity in access to health care for children across the world. Even within countries, inequities exist among various regions. However, over the years, there has been a gradual improvement in children's survival across the world. In the previous three decades, under-5 mortality has reduced by more than half. It was 12.6 million in

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1990 and has declined to 5.6 million in 2017.[2,3] This still is about 15,000 childhood deaths a day due to preventable causes such as preterm birth complications, birth asphyxia, pneumonia, congenital anomalies, diarrhea, and malaria.[2-4] These causes can be prevented or treated with simple, affordable interventions, including immunization, adequate nutrition, safe water and food, and quality primary health care.[4] Most of these deaths occur in low- and middle-income countries (LMICs).

Infectious diseases and inadequate neonatal care have been identified as significant threats to children's health worldwide over the last few decades. The global community has worked toward solving them, which is reflected in reducing childhood mortality rates, as mentioned above. However, we are facing newer and emerging threats that are impacting the health of children.[5] We need to stop or minimize these threats if we want to have a healthy global community in future. Some of the major threats that the children of the world are facing are discussed below.

CHILDHOOD OBESITY

One of the most critical public health challenges in the 21st century identified by the World Health Organization (WHO) is childhood obesity. The number of obese children and adolescents in the world increased from 11 million in 1974 to 124 million in 2016.[4] Childhood obesity is a significant risk factor for chronic noncommunicable diseases (NCD) such as diabetes, ischemic heart disease, hypertension, stroke, and cancer in adults.[5] These NCDs place a significant strain on countries' health-care systems and reduce the workforce's productivity due to absence from work due to sickness. Urbanization, junk food, smartphones, and lack of playing space are all responsible for the obesity epidemic. The obesity epidemic is no longer restricted to wealthy nations; it is also starting to appear in developing countries. Countries need to intervene fast to stop the epidemic of childhood obesity if they want to reduce the burden of NCDs among adults in future. Measures such as taxing junk food, providing safe play areas for children, and encouraging physical activity in children can reduce the rate of childhood obesity.

ENVIRONMENT AND CHILD HEALTH

Rapid industrialization over the last century has increased the emissions of greenhouse gases that are damaging the environment and leading to global warming.[6] Developing countries like India and China, which are trying to become economic powerhouses, are asking for developed nations to cut down emissions. Still, the latter is unwilling to give any concessions and wants the developing countries to reduce emissions. Climate change is a significant threat to the health and safety of children. Unseasonal droughts and floods are forcing families to migrate as agriculture becomes unviable. Migration leads to a severe impact on a child's physical and mental health due to a lack of access to immunization, clean drinking water, health facilities, and schools.[6] Children are also affected by environmental pollution as this can increase the incidence of respiratory diseases. Many cities in the World like New Delhi and Mexico City are struggling with alarming levels of air pollution that are not safe for human habitation.[7] However, Countries need to implement the Paris climate accord for reducing greenhouse emissions for the future of our children. The USA walking out of the agreement is a significant setback for the cause of controlling climate change.

NEONATAL CARE AND IMPACT ON FUTURE HEALTH

An essential but often ignored aspect of childhood is the fetal period, which together with the neonatal and infant period contributes significantly to long-term health, cognitive development, and economic outcomes.[8] Poor fetal growth or undernutrition in the first 2 years of life leads to permanent damage such as reduced adult height, poor school performance, and reduced adult income.[4] These children are also at risk of other NCDs if they put on weight rapidly in later childhood. It is estimated that 250 million children under 5 years will not reach full growth potential.[4] Most of these children live in LMICs. Maternal health is a vital component of child health. Ensuring adequate growth of the fetus needs mothers to be provided with good antenatal care, including nutrition support, promoting breastfeeding, iron supplementation, tetanus immunization, and safe delivery practices.[9] Evidence shows that the promotion of gender equality *per se* can address most childhood undernutrition issues and reduce mortality.[4,9] Therefore, we need to focus on integrated maternal and fetal health to ensure a healthy children's future.

CHILD MARRIAGE AND TEENAGE PREGNANCY

In many cultures, children are married before they attain the age of 18 years.[10] Child marriages are common in LMICs. Child marriages lead to teenage pregnancies. Such pregnancies are harmful to the mother and the child. They lead to increased maternal morbidity and mortality and increased childhood undernutrition and deprivation.[10] Teen pregnancies are not limited to LMICs; they are also

seen in high-income countries (HICs) and are associated with similar consequences. Governments need to act and enforce strict legislation to ban child marriages. However, in many countries, child marriages have strong cultural and historical roots, which might prevent the enacting of child marriage legislation.

IMPACT OF COVID-19 PANDEMIC ON CHILD HEALTH

The COVID-19 pandemic has substantially impacted health-care delivery and the economy irrespective of a nation's political, military, and economic power. Sovereign nations are relocating essential health care and financial resources to fight the COVID-19 pandemic.[11] The COVID-19 pandemic has had a significant impact on child health. It is a threat because it has the potential to erase gains over the decades. A modeling study by Roberton *et al.* estimates that there would 1,157,000 additional child deaths and 56,700 additional maternal deaths due to the indirect effects of COVID-19 on the health system across the world in the worst-case scenario.[12] These additional deaths would represent an increase of 45% in under-5 child deaths per month and a 39% increase in maternal deaths per month.[12]

Children are facing many indirect consequences of COVID-19 pandemic such as psychological impact due to school shutdowns, disruption in immunization services, decreased funding for child health programs, reduction in screening, and intervention program for malnutrition as staff are relocated for COVID-19-related work, poverty due to rising unemployment, and delayed treatment of severe diseases like cancer due to lockdowns and utilization of health services for the COVID-19 pandemic.[13,14] The United Nations Educational, Scientific, and Cultural Organization has estimated that till June 2020, 63% of students in 123 countries had disruption of their school education.[14]

Measles and polio immunization campaigns have been suspended in 27 and 38 countries, respectively, as of mid-May 2020, and these include countries with ongoing measles and polio outbreaks.[15] Further, between March and June 2020, about 67 countries reported moderate-to-severe disruptions or outright suspension of routine immunizations services.[15] There has been a 69% reduction in measles–mumps–rubella vaccination coverage in India since the onset of the COVID-19 pandemic.[15] The WHO estimates that nearly 3 million fewer children received diphtheria, pertussis, and tetanus vaccines between January and June 2020 than in the corresponding period in 2019.[16]

CHILD LABOR

Child labor is a work that deprives children of their childhood, their potential, and dignity, and that is harmful to their health. The majority of child labor is practised in LMICs. Data from the United Nations Children's Fund (UNICEF) suggests that 168 million children worldwide are involved in child labor.[17] The International Labor Organization estimates that out of the 152 million children doing child labor, 73 million are involved in hazardous work.[18] Poverty is the biggest driver of child labor. The developing countries in Africa and Asia account for nine out of every ten children in child labor. Nineteen percent of children in low-income countries are engaged in child labor. This is in contrast to 9% of children in lower-middle-income countries, 7% in upper-middle-income countries, and 1% in upper-income countries.[18] Therefore, poverty eradication should be a priority for improving child health. However, capitalism and globalization have fueled the need for cheaper products, and child labor helps in this cause by reducing production costs and increasing profits. HICs can eradicate child labor by implementing strict laws that ensure companies do not employ children in developing countries for producing their goods. There is a need for all UN members to pass a resolution to ban child labor.

CHILD ABUSE

Child abuse covers many situations ranging from physical violence, sexual abuse, child trafficking, social and emotional neglect, and exploitation, including child soldiers.[19] Child abuse as a threat for the children of this world has remained like the tip of the iceberg, with most of the issues remaining unseen and unheard. Many nations do not have legislation to protect against child abuse, and even if they have, these legislations are not effectively implemented. Poverty, illiteracy, and corruption contribute to child trafficking.[19] The world over the last two decades has woken to the problem of human trafficking. However, more needs to be done to eliminate trafficking. Increasing conflicts in various regions of the world like Syria, Iraq, Afghanistan, and Somalia have led to the recruitment of children as soldiers to fight wars. Children should be holding pens and pencils and not guns.

THREATS TO CHILD HEALTH AND SUSTAINABLE DEVELOPMENT GOALS

In 2015, the countries across the world agreed to the sustainable development goal (SDG). The SDGs are 17 interlinked goals that are designed to achieve a better and sustainable future for all.[20] The target to achieve

these goals is the year 2030. The recently published WHO-UNICEF-Lancet Commission on "A future of the world's children" stresses that children are a vital component of the SDG targets, and each of the goals is closely linked with childhood.[4] The SDGs identify threats that have been discussed above. However, very few countries report the threats identified for children like data indicators related to violence (physical, sexual, and psychological) for adolescent women (indicator 5.2.1 and 5.2.2), information on the prevalence of child marriage (5.3.1), child labor (8.7.1), literacy (4.4.1), children living below poverty line (1.2.1), and human trafficking (16.2.2).[4] Without data on the threats to child health, it will not be easy to find solutions.

RECOMMENDATIONS

Childhood obesity, climate change, child marriage and pregnancy, COVID-19, child labor, poor fetal and maternal health care, and child abuse are the most significant health-related threats that children face worldwide. They exacerbate the older known threats like infectious diseases, malnutrition, and poor neonatal care. These threats are not mutually exclusive as they all interact with each other, and the interactions are multiplicative rather than additive. The consequences of these threats can be immediate, like in teen pregnancy or delayed like in obesity. Some threats like the COVID-19 pandemic have both short and long-term adverse effects on the children's physical, mental, or social well-being.

There is no one solution to the threats to children mentioned above. Addressing the threats would need building robust health systems, good governance, and effective enforcement of the law. Governments, organizations like WHO, UNICEF and UN, civil society, and nongovernmental organizations need to cooperate and collaborate to ensure that every child has a bright future and the threats they face today are addressed with utmost urgency.[21]

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Perspective

Executive health checkup package at All India Institute of Medical Sciences, Bhubaneswar: A novel approach

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Abstract

Early detectionof a disease leads to relatively simple courses of treatment and prevents life-threatening complications. Many health conditions can be corrected or maybe improved through treatment modalities if they are discovered by health screening facilities. Health screening program such as executive health checkup is convenient, affordable, inexpensive, and vastly beneficial for the patients. Hence, health screening saves lives immensely by early detection of diseases and preventing serious complications. It is an effective component of healthcare. It achieves more positive effects than medical treatment and at a lower cost. Health promotion is aimed at influencing people's social circumstances and lifestyles so that their health is improved (or maintained) and disease is prevented.

Keywords: Executive health checkup, noncommunicable diseases, periodical examination, prevention

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INTRODUCTION

The concept of health monitoring for noncommunicable disease is gaining importance (NCDs) as it is the leading cause of mortality worldwide.[1] General physicians play a pivotal role in the prevention of disease and health promotion. The epidemiological transition (communicable diseases to NCDs) mandates adopting the concept of early screening of at-risk individuals, and combating premature morbidity and mortality from the NCDs and their life-threatening complications, on the[2] almost three-quarters of all NCD deaths, and 82% of the 16 million people who died prematurely, or before reaching 70 years of age, occur in low- and middle-income countries (LMICs).[2]

INCREASING BURDEN OF NONCOMMUNICABLE DISEASES

NCDs have been projected to increase globally by 15% between 2010 and 2020 (44 million deaths), with an estimated 10.4 million deaths in Southeast Asia. Deaths (premature mortality) before the age of 70 years in several LMICs like India have become a matter of concern.[3]

By influencing the social environment and lifestyle behaviors, we aim at preventing the emergence of risk factors for diseases. Apart from improving the quality of life is also increased due to fewer dreadful complications of NCDs. This indirectly influences the economic

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burden of the country and also individual families.[4] Such a step reinstates the already depleting faith of common people on government setup in providing adequate healthcare to the needy ones. Although the facilities available at lower levels of healthcare delivery system starting from subcenter to community health centers have been utilized under the National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke (NPCDCS), still many of the diseases remain undiagnosed due to lack of sophisticated laboratory tests, unlike a tertiary healthcare facility.

CONCEPT OF EXECUTIVE HEALTH CHECKUP

The concept of annual and periodic health checkups is not new and gives a good platform for the prevention of diseases and the maintenance of optimum health. An executive health checkup (EHC) is generally designed for individuals aged between 30 and 60 years and is recommended for those who are at a high risk of developing conditions such as diabetes, obesity, hypertension, and heart disease. It also includes an evaluation of cardiovascular health.

EXECUTIVE HEALTH CHECKUP AND PERIODICAL EXAMINATION

Executive clinics leverage a dual role of opportunistic screening of NCDs as well as the screening of outpatient departments in any tertiary care hospital.[5] An executive checkup package is offered by most hospitals, but the kind of tests and health examinations included in the package differs from one healthcare center to another. A detailed medical history is taken by the doctor along with the physical examination and certain laboratory investigations. Depending on the outcome, referral to a particular specialty or super-specialty is recommended. This initiative conceptualizes an idea of screening in combating premature morbidity and mortality.

The preventive component of community medicine practice has been the beacon whenever the need has been raised in any public health interest. This aspect, although not followed in a government setting, is largely practiced by private institutions.[6-8] Although there is no clear-cut definition of EHCs, the seeds of the idea were sown in the late 19th century in London.[9] Periodic health examination was the initial concept around which the intention of conducting a full-body checkup revolved.[9] Early sickness consultation was a term later but covered the same entities.[10]

EXECUTIVE HEALTH CHECKUP AT ALL INDIA INSTITUTE OF MEDICAL SCIENCES, BHUBANESWAR

All India Institute of Medical Sciences (AIIMS), Bhubaneswar, has initiated a biweekly EHC with a maximum of five patients per day. It was started in 2017, and around fourteen hundred beneficiaries have availed the services under the EHC clinic till now. EHC aims to extend the healthy life expectancy of the population, to avoid untimely death, and to improve the quality of life for people with a disease or disability. Generally, the private/corporate hospitals have expensive packages with an exhaustive list of investigations. However, AIIMS, Bhubaneswar, offers a very compact list of investigations [Table 1] and with a minimum charge of Rupees fifteen hundred only.

It is done at the EHC clinic, which is aligned with the NCD prevention clinic. With prior registration at the institute (AIIMS, Bhubaneswar), a person either healthy or sick gets access to the process of EHC. Then, the patient/person visits the EHC clinic where proper history-taking and adequate physical examination are done. After which the patient undergoes the list of investigations available under the EHC package [Figure 1]. Subsequently, based on the examination and reports, the concerned person is either advised medications or referred to the appropriate department for further evaluation and management.

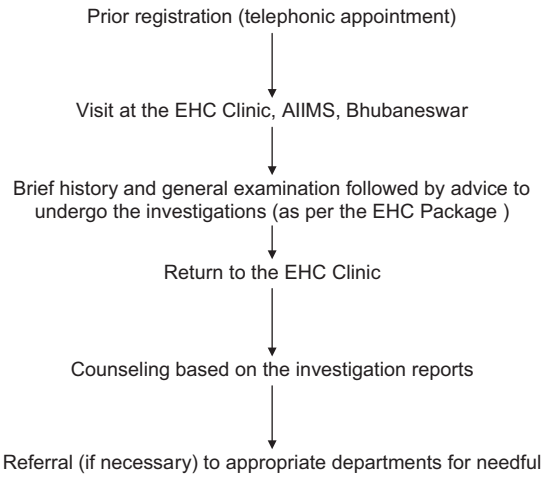

Figure 1: Flowchart of service delivery to the beneficiaries

Table 1: Minimum offered investigation at Rs. 1500/-

Complete blood count	Fasting blood sugar	HBA1c test
Liver function test	Thyroid profile	Electrocardiogram
Renal function test	Echocardiography	Chest X-ray (PA view)
Lipid profile	USG (whole abdomen and pelvis)	Urine (routine and microscopic examination)

HBA1c: Glycated hemoglobin, PA: Posteroanterior, USG: Ultrasonography

However, the frequency of conducting such initiatives depends on the requirement and availability of health resources.

BENEFICIARIES FOR EXECUTIVE HEALTH CHECKUP

Adults with family history of diabetes, stroke, obesity and cardiovascular diseases or those with sedentary lifestyle, faulty dietary habits, and alcohol intake, tobacco consumption are the dominant group of beneficiary. In addition, any adult who wishes for regular health checkup are also eligible for the executive health checkup.

BENEFITS OF EXECUTIVE HEALTH CHECKUP

There are profound benefits of EHCs in government institute (AIIMS, Bhubaneswar), which involves the implementation of various programs and policies such as the NPCDCS, aiming to reduce morbidity and mortality due to chronic diseases. Opportunistic screening of NCDs being one of the major benefits.

Certain investigations such as ultrasonography (USG) and echocardiography (done only on circumstantial requirements) increase the likelihood of incidental findings such as fatty liver and left ventricle hypertrophy (LVH). There is reduced interdepartmental referral time in reaching to a final diagnosis. Government health facility is adequately utilized in providing services at an affordable cost as compared to the private ones. With the affordability of the services, even poor people can utilize the opportunity of an executive health clinic. Due to the high cost of the complete health checkup in corporate hospitals, all sections of the society are still not able to undergo health checkup as a result of which modality of the preventive approach (through early screening) cannot be accomplished.

COUNSELING, TREATMENT, AND REFERRAL MECHANISM

Beneficiary with abnormal findings is counseled, and those requiring referral mechanisms for respective departments are effectively channelized through these executive health services. The inclusion of tests such as echocardiography justifies the initiative of EHCs. Findings of concentric LVH, subtle changes in the cardiac valves, and diastolic dysfunction because of the corresponding comorbidities dig out the hidden pathological changes that have already taken place in the biological system. Most women underestimate the perimenopausal/menopausal period considering it as a normal physiological phenomenon, and hence, hardly, any of them go for a gynecology consultation. However, they get benefited by the prior screening by USG, and changes in the uterus/ovaries get easily detected followed by a change in the health perception of the individual.

NCDs have become the major burden of diseases of hospital visits nowadays. Early screening and diagnosis followed by appropriate treatment can prevent or delay the occurrence of such diseases.[11] The idea of utilizing services of a health facility in a concentrated manner at EHCs can bring about a significant decline of diseases such as CVD, stroke, and cancer.

Such initiative is a significant step in fulfilling the objectives of the NPCDCS started by the Government of India in 2010.[12] The increase in a sedentary lifestyle, unhealthy dietary habits, and consumption of alcohol and tobacco leads to an increase in NCDs, resulting in premature death and disability rate increased in the last decade.

CHALLENGES AND OPPORTUNITY

The effectiveness of the EHCs can be strengthened by optimizing our skills while having a healthy discussion with the patients or their relatives.[13] The chances of complications increases with the long duration of disease. Identifying the risk factors prevents future diseases, and practicing good habits promotes good health. The ambit of the clinic can impact the mental health of the beneficiaries in a very positive manner as it sometimes unleashes hidden stress[14] and conditions such as depression or sexual dysfunction.[15]

Like the saying juice of a full orange comes with a load of peels, this setup has its own drawbacks. It is a time-consuming practice; rural population awareness and the chance of a regular follow-up are minimal. Further, there is an inability of interested ones to get a prior appointment due to tight logging of application forms.

However, despite the above lacuna, there is an opportunity of correcting the loopholes. Steps such as giving adequate time to take the detailed history and doing a comprehensive clinical examination should be stressed upon. Proper counseling of the patients for a regular follow-up if any enhances our effort in providing comprehensive coverage for common diseases and comorbidities. Strengthening the Information Education Communication and Behavior Change Communication activities through outreach approach can trigger the inflow of people from rural communities.

CONCLUSION

Executive health clinic in academic institute and tertiary care hospital can offer an opportunity of screening of chronic diseases and promoting healthy lifestyles. The implementation of executive health clinics can be without additional resources to the host institute.

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Conflicts of interest

There are no conflicts of interest.

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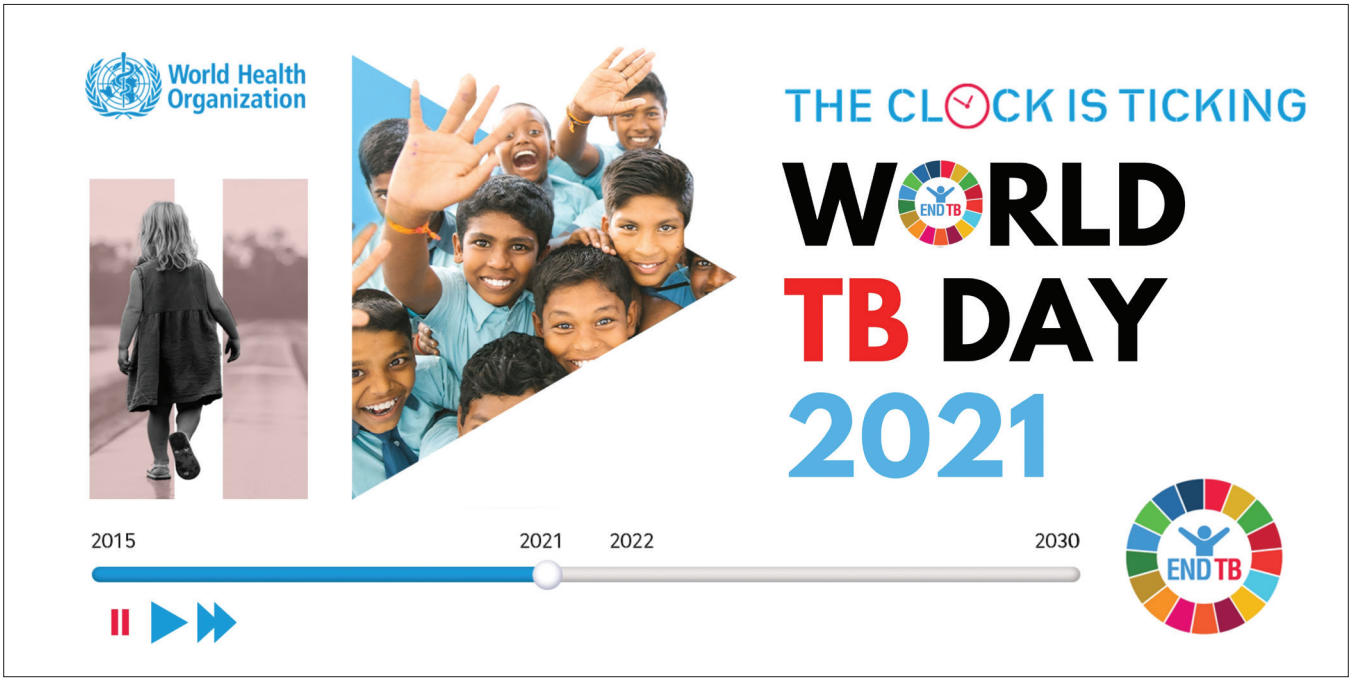

Review Article

Utility of acute-phase reactants testing in clinical practice

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Abstract

Acute-phase proteins (APPs) or acute phase reactants (APRs) are diverse biochemical proteins which are seen as a response in inflammatory processes due to varied etiologies. Some of these proteins increase and some decrease due to various mechanisms during inflammation. The secretion, time to attain peak concentrations, half-life, and degradation are different for different APPs. Some of the markers can be easily tested with minimum equipment whereas, others require sophisticated instruments. They are not pathognomonic for any one particular disease but their elevation may point toward a bacterial, viral, or noninfectious inflammatory process. Testing for APPs and interpreting the result in correlation with results of other tests and clinical details can help in arriving at a diagnosis, in ordering further appropriate tests and in taking treatment decisions. We attempted to look at the present published literature and summarize the different APRs in inflammation. A MEDLINE search for articles published in the English language, with acute-phase proteins [MeSH Terms] OR acute phase reactants [Text Word] was done for the years between 1985 and 2019. In addition, other cross-referenced articles were also searched for relevant data.

Keywords: Acute phase reactants, C-reactive protein, erythrocyte sedimentation rate, procalcitonin

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INTRODUCTION

Acute-phase proteins (APPs) comprise about 30 proteins that are biochemically and functionally unrelated to each other but come into play during inflammatory processes. A few of these proteins show marked elevations in the plasma and have been extensively studied. While others may not show marked variations in serum levels, they are affected by numerous confounding factors, their assays are difficult to perform, or due to various other reasons, they have been less extensively studied.

Broadly, the APP are divided as positive APPs and negative APPs. The positive APPs increase in the plasma during any inflammatory process, whereas, the negative APPs decrease in the plasma during inflammation. The response elicited to inflammation is called as "Acute-phase reaction" where the patient typically manifests fever along with leukocytosis with or without shift to left in the neutrophil counts. APPs and acute-phase reactants (APRs) are often used interchangeably.[1] Whenever there is a focus of inflammation, cytokines are liberated into the bloodstream by neutrophils and macrophages. Tumor necrosis factor-alpha (TNF-α), Interleukin (IL) 1, and IL 6 are the most prominent of all cytokines. They stimulate the hepatocytes to synthesize positive APPs and to reduce the production of negative APPs.[2]

Positive APPs are a part of the innate immune system. The immune system, complement system, and coagulation system are interrelated with each other and help in

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maintaining the internal milieu. Some of these proteins provide positive and negative feedback to the inflammatory process. Examples of positive APPs are C-reactive protein (CRP), Procalcitonin, erythrocyte sedimentation rate (ESR), Mannose-binding protein, Complement factors (C3 and C4), ferritin, ceruloplasmin, serum amyloid A and haptoglobin, fibrinogen, alpha 1 antitrypsin, and alpha 1 acid glycoprotein Table 1.[3]

Examples of negative APPs are albumin, transferrin, transthyretin, retinol-binding protein, antithrombin, transcortin, etc., It is thought that these proteins decrease to conserve amino acids and to divert them for the production of positive APPs.[4]

C3 is a complement factor and its level in plasma often decreases as it is consumed and hence, it is recognized as a negative APR [Figure 1].[5]

METHODOLOGY

A MEDLINE search for articles published in the English language, with keywords as APRs and APPs was done for the years between 1985 and 2019. In addition, other cross-referenced articles were also searched for relevant data.

CLINICAL SIGNIFICANCE OF TESTING

There are various causes for inflammation. Main stimuli that elicit an inflammatory response are infections due to various etiologies, namely, viral, bacterial, fungal, parasitic, helminthic, etc., significant trauma leading to tissue ischemia or necrosis, systemic autoimmune diseases, solid organ malignancies or hematopoietic malignancies, etc., Greater the stimulus, higher is the inflammatory response.[6] The measurement of APPs in plasma gives an estimate about the magnitude of the injury and follow-up measurements reflect the upward or downward trend of the disease. Serial measurements guide in taking treatment decisions and are helpful for prognostication as well.[9]

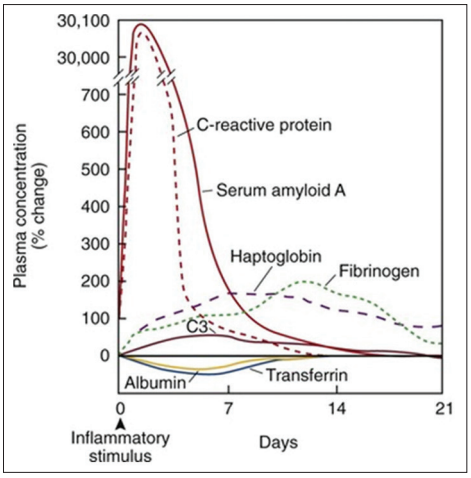

Figure 1: Acute phase reactants in moderate inflammation.[5] Several patterns of response are seen. Major acute phase reactant increase 100-fold (C-reactive protein, seum amyloid A), moderate acute phase reactant increase two to four-fold (fibrinogen, haptoglobin), minor acute phase reactant increase 50%–100% (C3) and negative acute-phase reactant show decrease in levels (Albumin and transferrin)

In present clinical practice, the ESR, CRP, Procalcitonin, are used extensively [Tables 1 and 2]. ESR is a nonprotein APR and is influenced by the amount of fibrinogen in plasma and also by plasma viscosity and is viewed as "indirect" APR.[10]

ERYTHROCYTE SEDIMENTATION RATE

The ESR measures RBC sedimentation rate when the blood sample is held in a vertical column for one hour. It is affected by various factors like fibrinogen, the shape of RBC, blood viscosity, presence of paraproteins, etc. It is elevated in noninflammatory conditions such as pregnancy, anemia, obesity, aging, chronic renal insufficiency, nephrotic syndrome.[11] It is low or normal in polycythemia as blood is viscous, sickle cell anemia, hereditary spherocytosis where the shape of the RBCs does not allow to form proper rouleaux, in conditions with low fibrinogen, and in severe liver disease. Whenever an inflammatory process begins, ESR starts rising within 24–48 h and with the cessation of the inflammation, it gradually comes back to normal values.

In health, the relative contributions of plasma proteins to this phenomenon are fibrinogen 55%, alpha 2-macroglobulin 27%, the immunoglobulins 11%, and albumin 7%.[12]

ESR is more useful, particularly in chronic inflammations. As ESR is mainly dependent on the elevation of fibrinogen, which has a half-life of approximately one week, the elevated level of ESR in a given patient may persist for a longer time even though the inflammatory stimuli have ceased. ESR value more than 100 mm/hour should be investigated for hidden pathologies and markedly elevated ESR provides a reliable "sickness index."[13]

C-REACTIVE PROTEIN

This APP has a rapid response time and short half-life of about 19 h. The type of inflammation does not have any bearing on catabolism. It has a wide reference range of 68–8000 microgm/L.[14] In mild inflammations and in some viral infections, the CRP rises to concentrations of 10–40 mg/L.[15] Elevation up to 40–200 mg/L are

Table 1: Commonly tested acute-phase reactants[3]

Acute-phase reactant	Normal values	Response time	Time to peak	Time to taper
ESR	0-10 mm/1st h in males 0-20 mm/1st h in females	Rises within 24-48 h of onset of inflammation	Gradually peaks	Becomes normal slowly after resolution of inflammation
CRP	<2 mg/L	Rises at 12-24 h	Peaks at 2-3 days	Falls quickly due to short half life of 19 h
Procalcitonin	<0.05 ng/ml	Detectable at 3-4 h	Peaks at 6-24 h	Falls quickly due to short half life of approximately 30 h

CRP and procalcitonin have short half-life of 19 h and 22-35 h and hence fall quickly after the cessation of the inflammatory stimuli.[7,8]
CRP: C-reactive protein, ESR: Erythrocyte sedimentation rate

Table 2: Other acute-phase reactants[9]

	Normal plasma concentration (g/L)	Plasma concentration in inflammation (g/L)	Response time (h)
SAA	0.001-0.0030	2.5	6-10
Alpha 1 antitrypsin	1.0-2.0	7.0	ND
Haptoglobin	1.0-3.0	6.0	ND
Fibrinogen	2.0-4.5	10.0	ND
Ceruloplasmin	0.15-0.6	2.0	ND
C3	0.55-1.2	3.0	48-72
C4	0.2-0.5	1.0	48-72

SAA: Serum amyloid associated, ND: Not defined

encountered in acute inflammation and bacterial infections whereas, higher elevation of more than 300 mg/L are likely in severe trauma and serious bacterial infections.[16]

It is thought that a serum CRP concentration of >60 mg/L is strongly indicative of infection while a serum CRP concentration <30 mg/L suggests that the presence of severe infection is unlikely. Generally, in good health, the CRP level is below 2 mg/L but can be up to 10 mg/L. The CRP rises after 12–24 h, and attains peaks in 2–3 days. In case of mild to moderate infections, uncomplicated skin infections, cystitis, or bronchitis, or other infections, it can rise to 50–100 mg/L within 6 h.[17] Values between 2 and 10 mg/L, may be seen with "metabolic inflammatory" states such as chronic smokers, renal disease, cardiac ischemia, arteriosclerosis, diabetes mellitus, and other low level noninfectious inflammatory conditions. High-sensitivity CRP (hsCRP) which is available nowadays can detect extremely low levels of CRP and is used as a marker for cardiac disease.[18] Bacterial infections as the cause for inflammation usually give very high CRP levels, usually more than 500 mg/L, as was observed in one study.[19] Interferon-alpha has an inhibitory effect on CRP production from hepatocytes and hence, in viral infections, a relatively low levels of CRP are encountered.[20] Serial estimation of CRP values can be helpful to determine the progress of the disease or the effectiveness of treatments. In the laboratory, different methods can be used to test for CRP. They are ELISA, immunoturbidimetry, nephelometry, rapid immunodiffusion, and visual agglutination. The sensitivity of these methods varies. The simpler visual agglutination methods can be used by health care workers in primary health care settings.

hsCRP is available nowadays and is used as a marker for cardiac disease.[18] This test can be done using laser nephelometry. It is a rapid test and takes 25 min only. It has a high sensitivity of 0.04 mg/L. Based on hsCRP, according to the American Heart Association, the risk of developing cardiovascular disease is quantified as:

Low risk: hs-CRP level under 1.0 mg/L, Average risk: between 1.0 and 3.0 mg/L and High risk: above 3.0 mg/L.

As compared to ESR, CRP is a better marker of acute-phase response as it is more sensitive and accurate. However, in acute inflammatory processes, in the very early stages, the ESR may be normal while CRP is elevated. Similarly, CRP returns to normal more quickly than ESR in response to therapy due to the shorter half-life of CRP as compared to fibrinogen. Hence, during the resolution phase, the CRP may be normal but the ESR may be elevated. Hence, the clinical correlation of these tests is very important.

PROCALCITONIN

Many cytokines like IL-1, IL-6, and TNF-α stimulate the secretion of the proximal convoluted tubule (PCT). In viral infections, due to the increased production of interferon-gamma, PCT levels decrease.[21] Procalcitonin has a few advantages over CRP and ESR as a test modality. It can be detected within 3–4 h and attains peak value within 6–24 h, i.e. much earlier than CRP and ESR. The normal serum concentration of PCT is < 0.05 ng/mL. Unlike CRP and ESR, the elevation of PCT is not encountered in other noninfectious inflammatory conditions like autoimmune diseases. However, temporary elevation can be seen in

massive trauma such as extensive burns or major surgery. It can also rise in any therapy that stimulates cytokines such as T-cell antibody therapy, granulocyte transfusion, or graft-versus-host disease. It can also increase in medullary carcinoma of the thyroid. PCT is a better marker than CRP for differentiating bacterial from noninfectious causes of inflammation as it is more sensitive and specific.[22] De Jager *et al*. in their study on patients with legionella pneumonia observed that early high values of PCT indicated a more severe disease, and constantly higher levels portended a worse prognosis for these patients.[23]

Procalcitonin testing is considered to be more specific for bacterial infections and is used for patients in primary care, emergency department, and intensive care units. It helps in the diagnosis of sepsis and guides antibiotic therapy. PCT helps in earlier diagnosis and better monitoring of patients than CRP testing because its rise as well as return to normalcy is quicker than CRP.[24]

Magrini *et al*. in their study analyzed patients with infection in the emergency department and recommended that its better to use a multi-diagnostic tools approach comprising of total white blood cell count, Procalcitonin and CRP to guide for antibiotic decision to arrive at a correct and quick diagnosis of infection and sepsis.[25]

Sridharan and Chamberlain[26] in their study observed that the diagnostic value of serum PCT concentrations for discriminating among systemic inflammatory response (SIRS), sepsis, severe sepsis, and septic shock remains to be established. Although higher PCT concentrations suggest a systemic bacterial infection as opposed to a viral, fungal, or inflammatory etiology of sepsis, serum PCT concentrations do not correlate with the severity of sepsis or with mortality. PCT concentrations are used to guide the escalation and de-escalation of antimicrobial therapy in sepsis.

CRP and procalcitonin have short half-life of 19 h and 22–35 h and hence fall quickly after the cessation of the inflammatory stimuli.[7,8]

HEPCIDIN

Hepcidin is an APR that plays a critical role in inflammation and iron homeostasis. It has an important role in anemia; there is a known relationship between iron metabolism and innate immunity. Synthesis of hepcidin is up-regulated by lipopolysaccharide and IL-6. Serum hepcidin test can be used in conjunction with blood culture and other tests to diagnose late-onset neonatal sepsis.[27]

At present, very few studies have looked at the use of circulating cytokine profiles as a strategy to predict disease severity and outcome in different diseases. Cytokines have been mostly studied to get insight into the immunopathogenesis of disease processes. These tests are not widely available for patient care services *per* SE.[28]

MANNOSE-BINDING LECTIN

Mannose-binding lectin (MBL) is an APP synthesized by hepatocytes and activates the Complement system via the lectin pathway. It facilitates the phagocytosis of miroorganisms. MBL has high affinity for mannose and other sugar residues on the cell wall of bacteria, viruses, and parasites. A study suggested that low MBL concentrations predispose to sepsis associated with Gram-positive infections but not Gram-negative bacteria.[29]

CYTOKINES

Certain cytokines like IL-6, IL-8, or TNF-α increase in the serum and precede the increase of CRP and stimulate the hepatocytes to produce CRP. It is unclear whether they are more sensitive than measurements of the APP response or whether they can provide any differential diagnostic information.

Even though immunoassay kits for IL-6, IL-l, and TNF are available, they are very expensive and not feasible in low-resource settings.

SPECIFIC PATHOLOGIES AND ACUTE PHASE REACTANTS

Sepsis and septic shock

Wacker *et al*.[30] in their meta-analysis involving 30 studies, concluded that procalcitonin is a good biomarker for early diagnosis of sepsis in critically ill patients with median values being 1.1 ng/ml.

A recent study from Korea that evaluated the activities of presepsin, PCT, IL-6, and hs-CRP for their utility in the diagnosis of sepsis has revealed that among the biomarkers tested presepsin activities significantly differed in infectious (1403.47 pg/mL) and noninfectious (239.00 pg/mL) group highlighting the importance of presepsisn in the diagnosis and prognosis of sepsis.[31] Vodnik *et al*.[32] in their recent study evaluated the performance of presepsin preoperative diagnosis of abdominal sepsis and found that presepsin was significantly higher in severe sepsis (1508.3 ± 866.6 pg/mL) group when compared to healthy individuals (258.7 ± 92.53) and SIRS patients (430.0 ± 141.33 pg/m).

Liu *et al*.[33] evaluated the diagnostic value of CRP test in detecting neonatal septicemia in their meta-analysis study of 1819 neonates. They observed a positive likelihood ratio (LR), sensitivity, negative LR, and specificity of the CRP test for neonatal septicemia as 5.63 (95% confidence interval [CI] =2.86–11.09), 0.70 (95% CI = 0.66–0.75), 0.36 (95% CI = 0.21–0.60), and 0.89 (95% CI = 0.87–0.91), respectively.

For skin and soft-tissue infections

Studies have shown that CR*P* values of more than 70 mg/L and an ESR of more than 50 mm/1 h predict a longer hospital stay and thereby indicate the severity of infection.[34,35] CRP more than 150 mg/L is indicative of the possibility of Necrotizing skin and soft tissue infection.

A better recovery for cases of surgical debridement is indicated when PCT ratio is more than 1.14 between day 1 and day 2 post debridement.[36]

For bone-related diseases

An elevated ESR level of more than 70 mm/hour with no other plausible explanation points towards the likelihood of bone involvement/osteomyelitis in a diabetic foot over that of cellulitis in a diabetic foot.[37] In another recent study, ESR remained high for 3 months only in patients with bone infection and was recommended to be used for the follow-up of patients with osteomyelitis.[38]

ESR (median value 60) and CRP have good sensitivity for pyogenic spondylodiscitis and if the values decrease within the first 4 weeks of treatment, it indicates a favorable prognosis.[39] In cases of prosthetic joint surgeries which are becoming common these days, postsurgery values of CRP and ESR may remain elevated for 6 and 26 weeks, respectively.[40]

Meningitis and neurosurgical infections

Serum Procalcitonin level more than 0.15 ng/ml has high likelihood of bacterial infection after the neurosurgical intervention.[41]

Infective endocarditis

Whenever the level of CRP remains high even after 1 week of treatment for infective endocarditis (>122 mg/L) and the initial value of procalcitonin is >0.5, it indicates a poor outcome.[42]

Pyelonephritis in children

Procalcitonin >0.5 ng/ml indicated a likelihood of pyelonephritis and renal scars in children with urinary tract infections.[43]

A study by Ko YH *et al*.[44] (n = 49) studied PCT as an early biomarker of septic shock in patients with acute pyelonephritis secondary to ureteral calculi. They concluded that elevated PCT was an early independent predictor of the development of septic shock in acute pyelonephritis associated with ureteral calculi.

As a guide for antibiotic use

Petel *et al*.[45] did a systematic review and meta-analysis to assess whether CRP testing can be done as a marker to guide antibiotic treatment duration in adults, children, and neonates. They found that in neonates, CRP-based algorithms shortened antibiotic treatment duration by −1.45 days (95% CI −2.61 to −0.28) in two randomized controlled trials (RCTs), and by −.15 days (95% CI −2.06 to −0.24) in two cohort studies, with no differences in mortality or infection relapse. In out-patient adults, they found five RCTs where, the risk difference for antibiotic treatment initiation in the CRP group was −7% (95% CI: −10% to −4%), with no difference in hospitalization rate. They concluded that the use of CRP-based algorithms reduces antibiotic treatment duration in neonates, and also decreases antibiotic treatment initiation in adult outpatients.

Wirz *et al*.[46] did a meta-analysis of randomized trials on the effect of procalcitonin-guided antibiotic treatment on clinical outcomes in intensive care unit patients with infection and sepsis. They observed that mortality in the 2252 procalcitonin-guided patients was significantly lower compared with the 2230 control group patients (21.1% vs. 23.7%; adjusted odds ratio 0.89, 95% CI 0.8–0.99; P = 0.03). Procalcitonin testing guided earlier discontinuation of antibiotics and reduced treatment duration (9.3 vs. 10.4 days; adjusted coefficient −1.19 days, 95% CI −1.73 to −0.66; $P < 0.001$).

Presepsin is a newer biomarker and is present in human blood and urine. Its normal serum concentration is 2–6 μg/ml in serum. It has similar diagnostic accuracy for sepsis when compared to procalcitonin and is still under investigation.[47]

SUMMARY

Measurement of APPs/reactants is an important step for patients in various settings within the hospital and in apparently healthy people having hidden underlying pathologies. Testing for any one single parameter is not that useful but instead, a multi-diagnostic approach would be more beneficial. The choice of tests depends on the clinical situation and suspected etiology. The time of sampling and the spacing interval of serial samplings are important.

Usually, CRP and Procalcitonin are useful in suspected cases of acute bacterial infections whereas, ESR is useful to screen for the presence of any chronic diseases. Cytokine assays may become the norm in the future.

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Conflicts of interest

There are no conflicts of interest.

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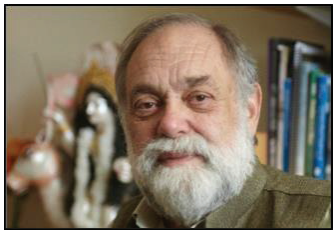
ADIEU & GRATITUDE

Prof Vinod K Srivastava

Professor Vinod Kumar Srivastava served as Principal & Director of many National institutes including King George's Medical University, Lucknow and Regional Medical Research Centre, Dibrugarh. He had obtained his training from India as well as overseas including Centre for Disease Control/Emory University. He had a brilliant academic career & contributed his expertise as Regional Councillor for South East Asia Region and Secretary, International Epidemiological Association at different levels. His contribution to science & Community Medicine has been immense and irreplaceable.



Richard A. Cash

Dr Richard A Cash was a visionary whose contribution to Oral Rehydration Therapy, Nutrition, Respiratory diseases, and tobacco control is well known. He dedicated his life in helping developing countries in Research & Ethics. He was the Visiting Professor at the Public Health Foundation of India in Delhi, at the James P. Grant School of Public Health at BRAC University in Dhaka, Bangladesh and the Achutha Menon Centre for Health Sciences Studies, in Trivandrum, Kerala, India. He was the recipient of the Prince Mahidol Award and in 2011 received the Fries Price for Improving Health. His contribution to the public health will continue to save lives for long term.

They may have left us but their values will live with us always. IJCFM family will deeply miss them.

Review Article

Plant-based diet: A solution to the sustainability of life and environment

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ABSTRACT The entirety of food and drink that an individual continually expends is called a diet. Proper nutrition – a sufficient, all-around offset diet with regular physical activity, frames the establishment for good health. The majority of the currently prevalent dietary recommendations are based on the health benefits of different individual food products. With the rising concern regarding climate change and evidence highlighting the influence of our nutritional practices on the environment, the time has come to redefine the dietary guidelines and recommendations considering the environmental impact of diet along with the health benefits. Studies have been reliably consistent with demonstrating that an equicaloric diet rich in plant-based products and lower in animal products is beneficial to health and put a lesser burden on the earth. There are five Sustainable Developmental Goals that can be linked with our dietary practices (no poverty, no hunger, good health and well-being, responsible consumption and production, and climate change). A plant-based diet is a suitable solution to the current crisis of noncommunicable diseases and climate change. Moving on to such a dietary practice would require immense changes in the currently prevalent food system with an emphasis on better production and waste management strategies along with improvement in food delivery and consumption practices worldwide. This article brings insight regarding the benefits of a plant-based diet and the need to address the ecological impact of animal-based foods.

Keywords: Disease, environment, nutrition, vegan, vegetarian

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INTRODUCTION

The aggregate of food and drinks that an individual continually expends is called diet. Numerous factors influence individual dietary practices such as moral and religious convictions, clinical need, or a wish to control weight. The objective of dietary practices should be to improve our well-being. There are two broad dietary patterns: an omnivorous and a vegetarian diet. Two significant variations of the vegetarian diet include the lacto-ovo-vegetarian diet, where meats are avoided, yet the utilization of milk and egg is permitted, and the vegan diet, where all items that stem from animals are avoided. Gussow in 1978 first used the term "Nutritional Ecology,"[1] and is defined as "a scientific area of research that encompasses the entire food chain, as well as its relations with health, environment, society, and economy."[2] It is a field of nutrition science dealing with the local and global impact of food production, processing, trade, and consumption. At present, nutrition sciences are dominated by the quality and health aspects

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of the food, with most of the currently prevalent dietary guidelines based predominantly on the physiologic requirement and toxicological considerations.

It is undeniable that food choices play a crucial role in human health, but in the past decade, awareness has grown regarding the impact of our dietary practices on the environment.[3,4] Although the environmental impact of food has been agreed upon, the real influence of the whole diet (the combination of food) on various indexes of ecological impact is still not established.[3] Theoretical analysis of the extent to which a diet affects the environment is usually derived by using the Life-Cycle Assessment (LCA)[5] method to individual food products or class of the food. LCA analysis, being based upon the dietary recommendations, average population consumption, and hypothetical/model diet,[6] fails to reflect the actual eating habit of a population. The data on the impact of individual food products such as meat and vegetables on the environment have been increasing as of the past decade. Still, there is a significant shortage of data regarding how a combination of this food which a population consumes influences the environment. The nutritional system has an impact on the environment, which in turn influences the quality of food.[7] Numerous studies demonstrate that plant-based diets are more environmentally friendly than animal-based diets.[8-10] With growing evidence, the time has come for us to consider the impact of dietary practices on our environment and incorporate the same while preparing dietary recommendations/guidelines. Our article aims to bring insight regarding the benefits of a plant-based diet and the urgent need to address the ecological impact of meat-based foods.

SUMMARY OF HISTORY AND EVOLUTION OF DIETARY PRACTICES AMONG PRIMATES

Humans largely resemble other primates in that they are omnivorous and have specific dietary necessities that feature adjustments to a diet composed mostly of fruits and vegetables (e.g. cannot synthesize Vitamin C). The dietary pattern of most primates can be grouped as faunivory (other animals, insects, and invertebrates), gumnivory (saps and gums), frugivory (fruits), gramnivory (nuts and seeds), and folivory (leaves and other plant parts). The eating regimens of most primates contain food from no less than two of these classes to meet both protein and caloric requirements. Leonard, in his book, mentions "Environmental variations in accessibility to adequate nourishment has consistently been a major stressor all through the evolutionary history, and continues to emphatically shape the nature of human populations today."[11] Contrasted with the preceding species of ancient humans, the emergence of *Homo erectus* showed (1) striking increment in brain volume and body estimate, (2) decrease in size of the posterior tooth and craniofacial stronghold, (3) the development of humanlike appendages, and (4) critical changes in scavenging/survival conduct.[12,13] Meat seems to have been progressively incorporated in the dietary pattern of *H. erectus* than its predecessors. Besides the energetic gains of utilizing more animal foods, Cordain[14] has noticed that he would likewise have gained an increased level of key unsaturated fats that are fundamental for supporting brain development and capacity. Mammalian brain development is dependent on adequate availability of two explicit long-chain polyunsaturated fatty acids: docosahexaenoic acid (DHA) and arachidonic acid (AA).[14] Bigger cranial capacity necessitates more DHA and AA; yet, all mammals have a constrained ability to synthesize these unsaturated fats from dietary precursors.[15,16] Thus, to advance bigger hominin brain sizes, more noteworthy utilization of DHA and AA would have been fundamental. Cordain *et al*.[17] found that wild plant supplies from the African grasslands contained practically zero AA and DHA, though muscle tissue and organ meat of huge African herbivores gave moderate to high amounts of these essential unsaturated fats. To outline, the current proof proposes that early *H. erectus* devoured a blended eating routine containing a more significant proportion of animal food than their forerunners. With the movement of time and advancement, people have built up a high level of dietary versatility, and human eating regimens extend from totally vegetarian (as in numerous populaces of South Asia) to ones centered almost exclusively on meat and animal foods (e.g. customary Eskimo/Inuit populaces of the cold). This capacity to use a different combination of plant and animal resources as sustenance is one of the highlights that allowed people to spread and colonize biological systems all through the world.[18]

PLANT-BASED DIET: EVIDENCE FOR LESSER MORBIDITY AND MORTALITY

The correlation between nutrition and health has always been a field of intense research and evidence continues to accumulate, showing the undisputable health benefit of plant-based diets. A meta-analysis by Yokoyama *et al*.,[19] published in 2017, summarizes 30 observational studies and 19 clinical trials that investigated the influence of a plant-based diet on lipid profile. The meta-analysis concluded that compared with an omnivorous diet, vegetarian diet consumption was associated with lower

total cholesterol, low-density lipoprotein cholesterol, and high-density lipoprotein cholesterol but with no significant triglyceride concentration difference. Thus, the consumption of a vegetarian diet offers a useful option in reducing coronary artery diseases. Another meta-analysis by Bechthold *et al*.[20] reviewed 123 reports and reiterates the benefits of whole grain, nuts, legumes, fruits, and vegetables in the prevention of coronary heart diseases (CHD), heart failure, and stroke. Dinu *et al*.,[21] in their systematic review with meta-analysis of 108 articles, found out a significantly lower risk of cancer incidence among vegetarians and vegans compared to omnivores. After analysis for localization of cancer was done, a nonsignificant reduction in the incidence of breast cancer, as well as mortality from breast, colorectal, prostate, and lung cancers, was reported among vegetarians compared to omnivores. From these reports, it can be concluded that the health benefits associated with a plant-based diet have been consistently proven positive over time by various studies in this field. Panel 1 summarizes the major health benefits associated with a plant-based diet.

DIET AND THE ENVIRONMENT

The past decade showed an increasing awareness and concern regarding climate change and how human activities have put a massive toll on our environment. Evidences have been steadily increasing to demonstrate that dietary patterns rich in plant-based sources (e.g. vegetables, fruits, seeds, nuts, whole grains, and legumes) and lower in animal-based products (particularly red meat), just as lower in total calories, are healthier and come with a lesser environmental burden on the earth.

From production until consumption, food systems have an environmental impact throughout the supply chain. Accounting for about 30% of the total greenhouse gas (GHG) emissions at the global level, the contribution of ecological food chains to global warming is significant.[31] Among the human diet, animal products, mainly processed meat, have a higher environmental burden than other food types, particularly considering energy utilization and GHG production matched with food mass[32,33] and protein.[34] De Vries and De Boer demonstrated that, of the various types of meat, generation of 1 kg beef utilized most land and resources, trailed by the production of 1 kg of pork, chicken, eggs, and milk.[35] There are various global (e.g. the Kyoto protocol) and national (e.g. Climate Change Act UK 2008) programs to lessen GHG emissions. Achievement of goals set by these agreements would require significant amendments in the currently prevalent global dietary patterns. Because of the high environmental burden from meat, numerous literature works have supported the advancement of vegetarian diets.[34,36,37] Plant-based dietary practices are less demanding on nature and require fewer natural resources for production, thereby addressing a portion of these environmental issues from the roots.

Panel 1: Health benefits associated with vegetarian diet

Have a lower BMI and less risk of obesity[22]
Lower risk of insulin resistance, prediabetes, and type 2 diabetes mellitus[23]
Favorable lipid profile[24,25]
Benefits for people with hypertension[24,25]
Lower risk of cardiovascular diseases (heart disease and stroke)[24,25]
Lowers the risk for colorectal cancers[26]
Vegan diets generally contain a variety of cancer-protective dietary factors[27]
Various phytochemicals in a vegan diet possess potent antioxidant and antiproliferative activities[27,28]
Increased consumption of tofu and other isoflavone-containing soy products has some protective effects against breast cancer in females[29]
Vegetarian diets are associated with a higher life expectancy compared with diets containing meat[30]

BMI: Body mass index

CURRENT SCENARIO

Every United Nations Member States in 2015 embraced the 2030 Agenda for Sustainable Development that gives a mutual outline to harmony and success among individuals and the planet, presently and later on. The 17 Sustainable Development Goals (SDGs), which frame the core, are an urgent call for action by all nations – developed and developing – through worldwide collaboration. They acknowledge that mitigating poverty and different hardships must run in melody with policies that improve well-being and education, lessen disparity, and goad financial development – all while going up against climate change and attempting to protect our seas and woodlands.[38]

There are at least five SDGs that can be benefitted if we can alter the dietary practices[38]

a. No poverty
b. No hunger
c. Good health and well-being
d. Responsible consumption and production
e. Climate change.

Moving on to a more plant-based diet could help prevent the wastage of natural resources and financial burdens associated with the production of processed meat, which is a significant content in most of the currently prevailing dietary patterns. Channeling the hence saved resources to increase the production of more plant-based food products will help address the issues of poverty and hunger.

Decreasing production of meat and the promotion of plant-based food would also help reduce the GHG output and help control the crisis of climate change. Plant-based diet being healthier, would enhance overall health and well-being. All these changes would also require a massive transformation of the currently existing global food system with an emphasis on responsible production and consumption. Various organizations and scientists around the globe, have acknowledged that moving toward less GHG-releasing food production and utilization practice is of most extreme significance to safeguard the ability of the earth to deliver nourishment for the generations to come,[39,40] yet globally set scientific targets are absent for healthy diet and sustainable food production. The EAT-Lancet Commission was set up to address this crisis and convened a panel of experts from throughout the world to develop global scientific targets for the food system. The Commission[41] published the Food, Planet, Health report,[42] recognizing food as the single most influential lever in optimizing human health and environmental sustainability on the earth. The committee acknowledges that transformation to healthy diets by 2050 will require substantial dietary shifts and would require more than doubling the consumption of fruits, vegetables, legumes, and nuts and above 50% reduction in global consumption of processed sugars and red meat.

The idea of a sustainable diet[40,43] is a problematic issue, and there are as yet numerous incongruities in our comprehension of what a sustainable diet might include.[43] Recently, the Food and Agriculture Organization defined a sustainable diet as "those diets with low environmental impacts which contribute to food and nutrition security and healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources."[44] The EAT-Lancet Commission proposed regulations and restrictions in global food production to decrease the risk of irreversible and potentially catastrophic damage to the earth's ecosystem. These boundaries in food productions are based on the global efforts to address climate change as per the Paris agreement (to keep global warming below 2°C). This would require widespread adaptation of mostly plant-based dietary practices along with significant improvement in the food production practices, all while reducing food losses and wastage. The committee suggested actions for the reduction of environmental impact by food production: (a) dietary shift – a more plant-based and less animal-based diet; (b) half wastage and reduced food loss; (c) improved production practices; and (d) improving water management, phasing out biofuels, rebalance of nitrogen and phosphorus through fertilizers, and implementation of all available options to mitigate food-related GHG emissions. Plant-based diet thus addresses a considerable portion of the current crisis in public health and environmental sustainability and has proven its superiority in this regard compared with animal-based diet. Revolutionizing the currently prevalent conventional and broad dietary propensities, where meat is one of the wholesome primary sources and ensuring that the population eats a healthy and balanced diet, with the least toll on our environment, remains a challenge to public health.

To acquire a healthfully adjusted eating routine, individuals should initially have appropriate learning of what establishes a healthfully modified and balanced diet. Second, openness is a crucial factor – the accessibility of specific ingredients and foods fortified with critical supplements that are otherwise lacking in the diet. The availability varies enormously, contingent upon the geographic district because distinctive nations have diverse fortification laws. A plant-based diet can have numerous subtypes based on individual preferences. A recent study published from the United States evaluating the cardiovascular benefits of different plant-based diet showed that not all plant-based diets are associated with a decreased cardiovascular disease risk.[45] Unhealthy plant-based foods such as refined grains and sugar-sweetened beverages have been in fact associated with a higher risk for cardiovascular diseases.[46-48] Greater adherence to this food often leads to diets with higher glycemic load and index, added sugar, lower levels of dietary fiber, unsaturated fats, micronutrients, and antioxidants, which could result in higher CHD risk. It is therefore important that in addition to promoting a plant-based diet, people need to be sensitized about the healthy plant-based foods such as whole grains, vegetables, nuts, and legumes. Vegan diet, which completely excludes all animal products (including animal derived), is such a dietary pattern that has gained immense popularity lately.

THE WAY FORWARD

The WHO has recently released the Global Nutrition policy review that analyzed the information on nutritional policy and programs by different countries.[49] Data were collected regarding the implementation of such policies, its coverage, stakeholders, and coordination mechanisms and how they were monitored and evaluated. Most of the countries (more than 90%) did have programs that addressed key nutrition issues (like undernutrition, vitamin and mineral deficiencies, obesity, and diet-related noncommunicable

diseases [NCDs]). The review succeeded in identifying the significant gaps in the design and contents of some policies and programs. The report emphasizes the need to strengthen nutrition governance like developing better program coordination, the collaboration between different ministries, agencies, and other developmental partners. They have also found out that most of the vitamin and mineral supplementation and fortification programs were inconsistent and inadequate in most of the countries. Programs to address obesity and diet-related NCDs are not given due importance and had less implementation. Better programs are needed to counter this rising epidemic of obesity, along with proper interventions. Market regulation of foods and beverages, limit on salt/sodium or trans-fatty acids, providing general awareness, implementing dietary guidelines, and promotion of healthy nutritional practices through media are some of the ways in which the government can tackle the problem of malnutrition. The concept of a healthy diet and counseling need to be integrated with all levels of existing health systems. Capacity building and allocation of adequate financial resources to the nutrition programs should be enhanced.

As quoted by the EAT-Lancet Commission, "Transformation to healthy diets by 2050 will require significant dietary shifts. Global consumption of fruits, vegetables, nuts, and legumes will have to double, and consumption of ingredients such as red meat and sugar will have to be decreased greater than 50%. A food regimen rich in plant-based meals and with fewer animal source ingredients confers both improved health and environmental benefits." The concept of a balanced diet and the benefits of a plant-based diet have been around for the past few decades. Further research to understand the environmental impact of a plant-based diet will be highly useful. Behavioral change communication and awareness regarding climate change and the benefits of a plant-based diet are needed for people to accept these new modifications to their lifestyle. The various issues that might arise when such a difference in dietary patterns include nutritional deficiency, the taste, and quality of meat compared to plant-based foods and people's mindset regarding the need for such a change. An international collaboration between different governments and agencies will yield a significant boost toward the goal of attaining sustainable development worldwide. Further operational research is needed to develop food policies which are cost-effective, culture-sensitive, keeping in mind the local availability of resources, the taste and preferences of the target population.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Diagnostic accuracy of Diabetes in Pregnancy Study Group of India criteria for the screening of gestational diabetes mellitus in primary care setting

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Abstract

Introduction: Although the Diabetes in Pregnancy Study Group of India (DIPSI) criterion is recommended by the Government of India guidelines, there is lack of consensus on a universal criterion for diagnosis of gestational diabetes. This has led to a wide variation of pregnant women being diagnosed with gestational diabetes mellitus (GDM). The WHO 1999 and International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria are widely used globally and in India as well. The objective of this study was to evaluate the diagnostic accuracy of DIPSI criteria in comparison to WHO 1999 and IADPSG criteria for diagnosis of GDM.

Materials and Methods: A community-based study was conducted for a period of 1 year. Oral glucose tolerance test was done on 506 pregnant women identified through house-to-house survey. The proportion of GDM cases by WHO, IADPSG, and DIPSI criteria was calculated. The diagnostic accuracy of DIPSI criteria was assessed by calculating sensitivity, specificity, and predictive values taking WHO and IADSPG criteria as gold standard.

Results: The prevalence of GDM was 14.2% by WHO criteria, 13% by DIPSI criteria, and 27.3% by IADPSG criteria; 10.3% were diagnosed by all the three criteria. The sensitivity and specificity of DIPSI criteria when the WHO criteria was taken as the gold standard was found to be 86.1% and 99.08%. The sensitivity and specificity of DIPSI criteria when the IADPSG criteria was taken as gold standard was found to be 44.93% and 98.91%, respectively.

Conclusion: The prevalence of GDM is found to be much higher by IADPSG criteria as compared to the WHO and DIPSI criteria. The single-step approach DIPSI criteria have good diagnostic accuracy and can be used in epidemiological studies and are feasible for diagnosis of GDM in primary care settings.

Keywords: Diabetes, Diabetes in Pregnancy Study Group of India, diagnosis of gestational diabetes mellitus, gestational diabetes

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INTRODUCTION

Gestational diabetes mellitus (GDM) which is glucose intolerance first detected in pregnancy is emerging as a major public health problem. The prevalence of gestational diabetes ranges from 1% to 28%.[1] It depends upon the population characteristics, screening, and diagnostic criteria used. Approximately 4 million pregnancies are complicated by GDM annually in India.[2] Therefore, there is a need for universal screening of all pregnant women for GDM.[3]

Globally, GDM is being diagnosed by using various criteria and there is lack of a universal accepted criterion. This may have an effect on the estimated prevalence of GDM and related health outcomes while also impacting on their health costs and quality of life.[4]

The Diabetes in Pregnancy Study Group of India (DIPSI) criteria which is a modification of the older WHO criteria, is recommended by the Government of India guidelines and used in epidemiological studies across India.[4] However, poor sensitivity and low positive predictive value of the test have also been reported.[5,6]

The International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria are based on the findings of the large-scale Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study and hence popular globally,[7] but its drawback is argued to be the large number of false-positive cases due to lower fasting cutoffs and hence adding to the burden of GDM.[6] Furthermore, it has a higher 2-h cutoff of 153 mg/dl and it is a matter of debate if the 2-h blood glucose levels between 140 and 153 mg/dl can be safely left untreated or not.[5] In addition, diagnosing the Indian population by international studies can be inconclusive as the HAPO study lacked Indian representativeness in its findings.[6]

Based on a large retrospective study comparing the IADPSG criteria and the WHO 1999 criteria, WHO criteria of 2-h plasma glucose of ≥140 mg/dl appeared to be sufficient to diagnose GDM.[8] Since both these tests are internationally accepted and widely used, it was planned to evaluate the diagnostic accuracy of DIPSI criteria in comparison to WHO and IADPSG criteria for diagnosis of GDM.

MATERIALS AND METHODS

This study is part of a prospective, community-based study to assess the maternal and fetal outcomes of GDM. However, in this article, only the diagnostic accuracy of the tests will be discussed. The study is set in the urban and rural field practice areas attached to the department of community medicine of a medical college in southeast district of Delhi and was conducted for a period of 1 year from December 2017 to December 2018. The study included consenting pregnant women between 18 and 28 weeks of gestation residing in the field practice area. The population of both the field practice areas is 1 lakh each. The number of pregnancies in both the areas together is 5000 approximately. Women with preexisting diabetes, renal disorders, pancreatic disorders, tuberculosis, or those who were on medications that are likely to cause dysglycemia were excluded from the study. The study was approved by the institutional ethical committee. Written informed consent was obtained from all the participants who agreed to participate in the study.

Sample size

Adequate sample size was computed as in a diagnostic test study with calibrated outcome. The sensitivity and specificity of DIPSI and the candidate test were assumed to be 70% (with absolute precision of ± 10%) and 80% (with absolute precision of ± 10%), respectively, with WHO and IADPSG as gold standard separately. To detect the above sensitivity and specificity with 95% confidence level, we were required to enroll 61 GDM cases. In a multicentric study, the average prevalence of GDM was reported to be 15% from India.[2] Thus, assuming prevalence of GDM of 15% in the screened population, we needed to screen at least 480 pregnant women in order to get about 61 women with GDM. Therefore, a total sample size of 500 was fixed.

Sampling technique

The study used a two-stage cluster sampling technique to ensure the random selection of the study participants. The primary sampling units were the geographical clusters of the field practice area and the secondary sampling unit was households with pregnant women. Appropriate geographical clusters that were mutually exclusive were identified from the field practice areas. All the clusters in the population were listed, 20 clusters were selected by using simple random sampling strategy. In order to meet the required sample size, 10 clusters from rural and urban field practice area were selected and 25 women were taken from each cluster. Consecutive sampling was done in the clusters until the sample size for the cluster was reached. In the case of the required sample size not being met from that cluster, adjacent cluster was taken up to complete the sample. Since the complete enumeration of the pregnant women was not available, simple random sampling was not possible. Thus, to ensure representativeness of the study population, as well as keeping in mind the feasibility

of the study, it was decided to use cluster sampling for the study.

Operational definition

Index test

The DIPSI criteria: It defines GDM as those cases who have a single blood glucose value of more than or equal to 140 mg/dl g taken 2 h after 75 g glucose load, given irrespective of fasting or nonfasting state.[4]

Reference tests

1. WHO criteria of GDM: Pregnant women having fasting blood glucose more than or equal to 126 mg/dl or those with a 2-h blood glucose after 75 g glucose load more than or equal to 140 mg/dl were labeled as GDM[8]
2. The IADPSG criteria: It defines GDM as fasting blood glucose more than or equal to 92 mg/dl or 1-h blood glucose following a 75 g oral glucose load more than or equal to 180 mg/dl or 2-h blood glucose following 75 g glucose load more than or equal to 153 mg/dl.[7]

Data collection

The pregnant women between 18 and 28 weeks of gestation residing in the geographical clusters were identified by house-to-house survey with the help of Medical Social Worker. The women were sensitized about GDM and the study being conducted and written informed consent was taken. A detailed history and thorough clinical examination was done. Body mass index (BMI) was calculated based on the prepregnancy weight and height. At the time of enrollment, all women were given 75-gm glucose load orally after dissolving in approximately 300 ml water within 10 min irrespective of their previous meal as recommended by DIPSI. Blood sugar was measured after 2 h. Considering the utility of capillary blood glucose assessment, plasma calibrated and standardized glucometer was used to evaluate blood sugar 2 h after the oral glucose load.[9,10] If vomiting occurred within 30 min of oral glucose intake, the test was repeated the next day.

For the fasting oral glucose tolerance test (OGTT), the women were asked to report to the rural and urban health center, respectively, within 72 h of enrollment and after 8 h of overnight fasting and 48 h of regular diet. A fasting venous sample was taken for glucose estimation. The women were given a 75 g glucose in 300 ml water to be consumed in 10 min. After 2 h of the glucose load, sample was obtained of the venous blood for glucose estimation. The glucose estimation was done by hexokinase method. The machine used was Dimension RxL Max (Siemens). Calibration of the analyzers was done as per the directions of Dimension Rx Max. Internal Quality control was run once a day. The Quality control used was supplied by Biored. The laboratory also participates in the External Quality Assessment Scheme (EQAS) once a month. Samples are received from EQAS and analyzed in the laboratory every month and accuracy was compared with the standard. The flow of study is as shown in Figure 1.

Statistical analysis

The data were entered in Microsoft Excel and analyzed in IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. (Armonk, NY: IBM Corp.). The proportion of GDM was computed based on WHO, IADPSG, and DIPSI criteria. The diagnostic accuracy of DIPSI criteria was assessed by calculating sensitivity, specificity, and predictive values taking WHO and IADSPG criteria as gold standard. Kappa statistic was also calculated to find out the level of agreement between different diagnostic criteria.

RESULTS

A total of 506 pregnant women underwent both the fasting and nonfasting OGTTs. Out of the 506 women, 72 tested positive for GDM by WHO criteria, 138 tested positive by the IADPSG criteria, and 66 tested positive by DIPSI criteria. The women who were diagnosed by GDM by the three criteria were not always the same. The prevalence of GDM was found to be 14.2% by WHO criteria, 27.3% by IADPSG criteria, and 13% by DIPSI criteria. 11.06% of the women were diagnosed with GDM by both WHO and IADPSG criteria, 11.8% by both WHO and DIPSI criteria, 10.5% by both IADPSG and DIPSI criteria, whereas only 10.3% of the women were diagnosed with GDM by all the

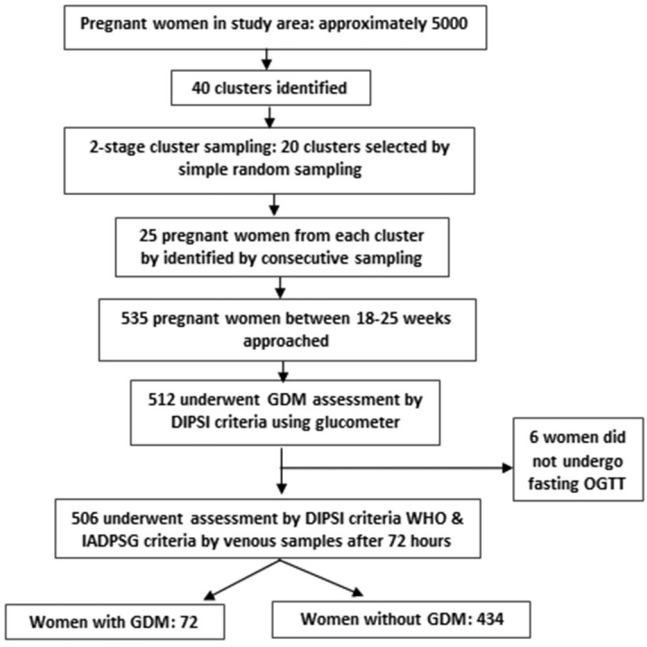

Figure 1: Flow of the study

three criteria [Figure 2]. The age at conception and BMI of the pregnant women and its comparison by all the three criteria used in the study are shown in Table 1.

Out of the 72 women that were diagnosed with GDM using WHO criteria, 62 were also labeled as GDM using DIPSI criteria, whereas out of the 434 diagnosed as non-GDM using WHO criteria, 430 were also labeled as non-GDM using WHO criteria. Thus, the sensitivity of DIPSI criteria using the WHO criteria as gold standard was found to be 86.1%, whereas the specificity was found to be 99.08%. The positive predictive value and negative predictive value for DIPSI with WHO criteria as the gold standard were found to be 93.94% and 97.73%, respectively. The agreement kappa statistic for WHO and DIPSI was found to be 0.92 and this was found to be statistically significant with $P < 0.001$, indicating excellent agreement.

On the other hand, out of the 138 pregnant women who were diagnosed as GDM using IADPSG criteria, only 62 were also detected using DIPSI criteria, whereas out of the 368 women diagnosed as non-GDM using IADPSG criteria, 364 were also declared as non-GDM using DIPSI criteria. Thus, the sensitivity of DIPSI using IADPSG criteria as the gold standard was found to be 44.93%, whereas the specificity was found to be 98.91%. The positive predictive value and negative predictive value were found to be 93.9% and 82.7%, respectively. The agreement kappa for DIPSI and WHO was found to be 0.46 indicating good agreement, with a statistically significant $P < 0.001$.

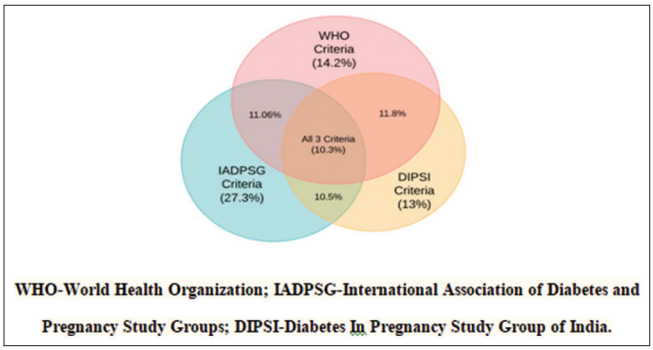

Figure 2: Venn diagram showing detailed breakup of patients diagnosed as gestational diabetes mellitus by different methods

The diagnostic accuracy parameters are shown in Table 2.

DISCUSSION

In the present study, the prevalence of gestational diabetes was found to be 14.2% by WHO criteria and 27.3% by IADPSG criteria, 13% by DIPSI criteria, and 10.3% by all the three criteria. Similar findings were observed in a study done by Rajput *et al.* where the prevalence was found to be 13.9% by the WHO criteria[11] and another study done by Agrawal *et al.*, where the prevalence was observed to be 13.5% by DIPSI criteria.[12]

In this study, the prevalence of gestational diabetes was found to be higher by IADPSG cutoffs (27.3%) as compared to WHO criteria (14.2%). A high prevalence of GDM (41.6%) by IADPSG in North India has also been found by Gopalakrishnan *et al.*[13] The WINGS-6 study that compared the WHO and IADPSG criteria found a prevalence of 14.9% by WHO criteria and 18.9% by IADPSG criteria which was significantly higher.[14] These results match with the findings of the present study as well and highlight the increased prevalence of gestational diabetes when estimated using the IADPSG criteria.

In our study, 77.8% of those diagnosed by WHO criteria also tested positive by IADPSG criteria whereas 40.6% who tested positive by IADPSG criteria also tested positive by WHO criteria. Similarly, in the WINGS-6 study, 65.1% of the women identified by WHO criteria were also picked up by the IADPSG criteria whereas 43.5% identified by the IADPSG criteria were picked up by the WHO criteria as well.[14]

In the present study, we found the sensitivity, specificity, positive predictive value, and negative predictive value of DIPSI criterion to be 86.1%, 99.08%, 93.94%, and 97.73% respectively when compared to WHO criteria. Saxena *et al.* also found the sensitivity, specificity, positive predictive value, and negative predictive value of DIPSI

Table 1: Comparison of the study population characteristics according to the 3 diagnostic criteria

	WHO criteria		DIPSI criteria		IADPSG criteria	
	GDM	non-GDM	GDM	non-GDM	GDM	non-GDM
Age distribution						
Mean	25.9 yrs	24.7 yrs	25.8 yrs	24.7 yrs	25.4 yrs	24.7 yrs
Std. deviation	4.43	3.9	4.5	3.9	4.1	3.9
BMI						
Mean	24.5 kg/m^2	21.1kg/m^2	24.2 kg/m^2	21.2 kg/m^2	22.8 kg/m^2	21.1 kg/m^2
Std. deviation	4.19	3.16	4.1	3.2	4.08	3.17

WHO: World Health Organization, DIPSI: Diabetes in pregnancy study group of India, IADPSG: International association of diabetes and pregnancy study groups, BMI: Body mass index, GDM: Gestational diabetes mellitus

Table 2: Comparison of single step, non-fasting 2-hr DIPSI test with other oral glucose tolerance tests

Statistical parameters	WHO OGTT	IADPSG OGTT
Sensitivity (%)	86.10 (75.90-93.13)	44.93 (36.46-53.62)
Specificity (%)	99.08 (97.60-99.70)	98.91 (97.24-99.70)
True positive (*n*)	62	62
False positive (*n*)	4	4
False negative (*n*)	10	76
True negative (*n*)	430	364
PPV (%)	93.94 (85.33-97.64)	93.90 (85.18-97.66)
NPV (%)	97.73 (96.03-98.71)	82.7 (80.46-84.78)
Likelihood ratio of a positive test	93.43 (35.07-248.91)	41.33 (14.33-111.36)
Likelihood ratio of a negative test	0.14 (0.08-0.25)	0.56 (0.48-0.65)
Diagnostic accuracy (%)	97.23 (95.40-98.48)	84.19 (80.71-87.26)

PPV: Positive predictive value, NPV: Negative predictive value, OGTT: Oral glucose tolerance test, IADPSG: International association of diabetes and pregnancy study groups, WHO: World Health Organization

criteria to be 96%, 98%, 79.3%, and 99.8%, respectively,[15] whereas Sharma *et al.* found DIPSI to be 100% sensitive and 100% specific in diagnosing GDM.[16] The agreement kappa statistic for DIPSI and WHO was found to be 0.92 ($P = 0.01$) indicating a 92% agreement. Likewise, Saxena *et al.* found the kappa statistic to be 0.868, indicating excellent agreement similar to the findings of this study.[15]

The sensitivity and specificity for DIPSI criteria when compared to the IADPSG criteria were found to be 44.93% and 98.9%, respectively, in the present study. Similar results were observed by Srinivasan and Reddi who found the sensitivity and specificity to be 45.45% and 87.70%, respectively.[17] The positive and negative predictive values of DIPSI in comparison to IADPSG were found to be 93.9% and 82.7%, respectively, in this study. In contrast, the study done by Srinivasan and Reddi found the positive predictive value to be 40.00% and negative predictive value 89.92%.[17] Mohan *et al.* found a specificity of 97.8% for DIPSI criterion which was similar to our study results, but the sensitivity was 22.6% which was much lower than our study.[18] The agreement kappa statistic between DIPSI and IADPSG criteria as observed in the present study was found to be 0.46 ($P < 0.001$) indicating a 46% agreement. However, kappa statistic by Mohan *et al.* was found to be 0.314 indicating disagreement between DIPSI and IADPSG.[18]

Rationale for Nonfasting status OGTT: A nondiabetic pregnant woman would be able to maintain euglycemic state even after a meal due to adequate and brisk insulin response, whereas women with GDM will not be able to do so because of impaired glucose secretion.[19] Therefore, in situations where a fasting test cannot be done, the nonfasting OGTT can be used, with lower cutoff points to increase sensitivity as a screening test, which forms the basis of DIPSI criterion for diagnosing GDM.

The DIPSI criterion has other advantages too. As the pregnant women need not be fasting, she will not experience morning sickness and will not have nausea or vomiting after glucose load. It also causes least disturbance in a pregnant woman's routine activities. It can serve as both screening and diagnostic procedure and in management.

In the Indian population, where there are challenges of accessibility to test centers, a test that requires a fasting state is often not feasible. Therefore, a one-step test with acceptable diagnostic accuracy is desirable, particularly in primary health-care settings. A one-step test that requires less training and which can be administered in the community using simple instruments such as a glucometer is beneficial to ensure that a larger population is covered for the screening of GDM.

Strengths of the study

This was a prospective community-based study where the study population was series of participants defined by the selection criteria. These participants were recruited by using cluster sampling technique. While carrying out the study, all the requirements needed as per the Standards for Reporting of Diagnostic Accuracy were strictly followed. The index test and reference test were done after a gap of 72 h and data were simultaneously collected.

CONCLUSION

The DIPSI criteria has good diagnostic accuracy and compares well with the WHO criteria. Therefore, it can be used in epidemiological studies and for diagnosis of GDM in primary care settings. The single-step approach of diagnosis makes it feasible and acceptable for use and therefore can ensure fewer noncompliance and dropouts and greater completion of the test. The findings of this study show that the prevalence of GDM is found to be much higher by IADPSG criteria as compared to the WHO and DIPSI criteria because of a lower fasting cutoff. The study recommends that universal screening which is already recommended must be scaled up and

implemented at all peripheral levels. The medical officers and other health-care staff must be adequately trained in screening and diagnosis using the DIPSI criteria so as to ensure accurate diagnosis and minimal deviation from the protocol.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Mental health problems among health-care workers during the COVID-19 pandemic

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Abstract

Introduction: As the pandemic of COVID-19 stretches, its wings across the different parts of the world over the past few months, it is very likely that mental health problems increase, particularly among the health-care workers who have higher risk of exposure to the disease and also to sufferings of the people affected with the disease.

Objective: To assess the prevalence and factors associated with depression, anxiety, and stress among health-care workers from Kerala during the COVID-19 pandemic.

Materials and Methods: A cross-sectional study among 544 health-care workers from Kerala was conducted by a self-administered online questionnaire in Google Forms by chain referral sampling with Depression, Anxiety, and Stress Scale-21 scale during initial phase of the COVID-19 pandemic. The tests of significance used were Mann–Whitney U-tests and Kruskal–Wallis tests. Odds ratios and 95% confidence interval are estimated.

Results: During the early pandemic period, 9.7% of health-care workers had mild depression and 13.3% had moderate-to-severe depression. While 4% had mild anxiety and 3.5% had moderate-to-severe anxiety, about 6.8% had mild stress and 6.4% had moderate-to-severe stress. The anxiety symptoms were significantly higher among nurses compared to doctors. Emotional and social support from higher health authorities is a significant protective factor against stress and depression. Frontline workers have 84% higher risk to have depression.

Conclusions: Frontline health-care workers who are directly involved in the screening, diagnosis, treatment, and care for patients with COVID-19 are at higher risk of experiencing poor mental health outcomes. Emotional and social support from higher health authorities is a significant protective factor against depression and stress among health-care workers.

Keywords: Anxiety, COVID-19, depression, health care workers, Kerala, stress

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INTRODUCTION

Millions of people across the world are facing challenges due to COVID-19 since the past few months. The novel coronavirus disease emerged in December 2019 in Wuhan, China. Since then, the virus has been threatening the health and lives of millions of people. High communicability of disease with the possibility of causing severe respiratory disease and lack of specific

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treatment has quickly affected health systems in many countries. Director-General of the World Health Organization declared that the outbreak of novel coronavirus as Public Health Emergency of International Concern On January 30, 2020.[1] The COVID-19 disease has achieved pandemic status. On May 19, 2020, there were 4,731,458 cases of COVID-19 and 316,169 deaths in the world.[2] Many countries including India adopted extraordinary measures such as lockdown and social distancing to prevent the spread and limit the outbreak. The lives of millions of people had a drastic change globally during the past few months during the COVID-19 pandemic.

As the pandemic of COVID-19 continue to spreads in the different parts of the world over the past few months, it is likely that mental health problems increase among people, and this may be particularly high among the health-care professionals who have higher risk of exposure to the disease and also to sufferings of the people affected with the disease. The health-care workers are involved in triaging, diagnosing, treating, and caring patients who may have the infection, which they are not sure till the person gets tested and diagnosed for COVID-19. There may be many asymptomatic and mildly symptomatic cases, who are not diagnosed. Health-care workers face them frequently and hence may have an increased risk of contracting COVID-19 infection, while most of the population is sitting inside. On a positive note, health-care workers are likely to feel much positive experiences such as pride and satisfaction in taking part in the big war against COVID-19 and they consider this as service to humanity in the face of the pandemic. Even without considering their risk of being infected, they show great altruism and dedication in the work setting. However, the psychological feelings of fear of being infected and risk of infecting family and friends along with many other stressors such as stigmatization toward the health-care providers working with COVID-19 patients, physical strain of personal protective equipment, and higher demands in work setting may lead to increasing levels of stress, anxiety, and depression.

Across the world, many health care workers get affected by the disease, leading to the loss of their lives. Among the health-care workers, in different studies showed that 14%–15% had clinically relevant (that is, moderate or severe) depression[3,4] and was 12%–24% had anxiety.[4,5]

Kerala, a small state in the southern end of India, which has a population of nearly 37 million, is known for its high literacy and relatively good health indicators.[6] The first case in India was reported on January 30 in Kerala in a student who returned from Wuhan, China.[7]

Three months after the first case, Kerala is managing well and keeping test positive caseload at a considerably low number of 642, of which 497 are declared cured, with 3 deaths and 142 remaining active cases in hospitals as of May 20, 2020.[8]

The objectives of this study are to assess the depression, anxiety, and stress among health-care workers from Kerala during the COVID-19 pandemic and the factors associated with it. This study will offer governments and policymakers' relevant data for an evidence-based strategy to improve mental health intervention among health-care workers.

MATERIALS AND METHODS

A cross-sectional survey was conducted among health-care providers from Kerala. All health care workers which include modern medicine doctors, nurses, and other paramedical workers were included in the study. Those who do not give a consent and who are not working now were excluded from the study. Data were collected from 544 health-care workers including doctors, nurse, and other paramedical worker from various districts of Kerala. Study period was May–June 2020. Sample size was calculated with the prevalence of depression as 15%[4] and alpha as 5% and relative precision as 20% of prevalence. The participants were invited from all districts in Kerala to participate in the online survey by chain referral sampling through the contact network of the investigators and students of the institution. The link of the questionnaire was sent through e-mails, WhatsApp, and other social media to the contacts of all the investigators from all 14 districts of Kerala who could refer more health-care providers and they were requested to roll out the questionnaire to more participants through social media groups of health-care personnel. The participants were encouraged to roll out the survey to as many health-care workers in their area as possible. Thus, the link was forwarded to health-care workers apart from the first point of contact and so on. After receiving and clicking the link, the participants were auto directed to the information about the study and informed consent. Once they agreed to participate in the survey, they filled up self-reported questionnaire. As this was a self-administered questionnaire, a consent form was introduced first to ensure autonomy and they were invited to fill the questionnaire in Google Forms after giving their consent. The validated Depression, Anxiety,

and Stress Scale-21 (DASS-21)[9] was used to assess anxiety, depression, and stress among health-care workers from Kerala. The self-reported questionnaire also included information on socio-personal characteristics such as age, sex, marital status, profession, seniority in experience, presence of chronic medical illness, type of profession, type of hospital, presence of elderly, or children <12 years at residence. Participants were also asked whether they were directly engaged in clinical activities of triaging, diagnosing, treating, or providing nursing care to patients with elevated temperature or patients with suspected/confirmed COVID-19. The health-care workers who answered yes were defined as frontline workers, and those who answered no were defined as second-line workers. The DASS-21 is the shortened version of the DASS developed by Lovibond which contains 21 questions to assess symptoms of depression, anxiety, and stress among adults. It consists of 21 items in a four-point scale. After collecting data, scores on three subscales namely Depression, Anxiety, and Stress were calculated and categorized depending on the score obtained into normal, mild, moderate, severe, and extremely severe.[10]

Approval of the Institutional Ethics Committee (IEC) of SGMC and RF was obtained before starting the study (SGMC IEC No. 37/515/04/2020). Confidentiality of data was maintained. Personal details are omitted to maintain confidentiality.

Statistical analysis

Data in excel were imported to SPSS (version 16.0) SPSS Inc, Chicago, Illinois, US for analysis. Descriptive and inferential statistical analysis was done. Mean and standard deviation (SD) were calculated for normally distributed continuous variables. Median and interquartile range (IQR) were calculated for quantitative variables which are not normally distributed. The nonparametric Mann–Whitney U-tests and Kruskal–Wallis tests were used to compare the severity symptoms between 2 or more groups when variables were nonnormally distributed. $P < 0.05$ was considered as significant. To identify risk factors for symptoms of depression, anxiety, and stress in participants, univariate binary logistic regression followed by multivariate logistic regression was done, and the measure of effect for significant variables is presented in terms of odds ratios (ORs) and 95% confidence interval (CI).

RESULTS

Among the 544 participants, 358 (65.8%) were females. The participants were of age ranging from 22 to 78 years. The mean age of the participants was 31.1 ± 10.8 years. Table 1 shows the socio-personal details of the study participants. Among the participants, 236 (43.4%) were currently married. Out of the total, 255 (46.9%) were reported to be workers who are in the front line, involved in triage, diagnosis, treatment, or care of patients with suspected/probable/confirmed cases of COVID-19. Out of the total 544 health-care professionals, 391 (71.9%) were doctors, 63 (11.6%) were nurses, and the rest 90 were other paramedical workers from all districts of Kerala, working in primary, secondary, or tertiary care hospitals. History of previous mental illness was reported by 6 (1.1%). Table 2 show the prevalence of depression, stress, and anxiety among health-care workers. Majority of the participants (67%) got emotional and social support from family, colleagues and also higher health authorities.

The symptoms of anxiety, depression, and stress were significantly higher among the frontline workers. The frontline workers had a significantly higher median score of DASS depression, stress, and anxiety scales compared to non-frontline workers. The median score of anxiety among frontline workers was higher (2 with IQR of 4), compared to a median of 1 among non-frontline workers with IQR of 3 ($P < 0.001$). The median score of stress among frontline workers was also high (6 with IQR of 10) compared to a median score of

Table 1: Socio personal details of the study participants (*n*=544)

Variable	*n* (%)
Gender	
Male	186 (34.2)
Female	358 (65.8)
Marital status	
Single	308 (56.6)
Married	236 (43.4)
Category of experience	
Junior	316 (58.1)
Intermediate	133 (24.4)
Senior	95 (17.5)
Type of hospital currently working	
Primary care	102 (18.8)
Secondary care	84 (15.4)
Tertiary care	358 (65.8)
Profession	
Doctor	391 (71.9)
Nurse	63 (11.6)
Other paramedics	90 (16.5)
Chronic illness	
Yes	42 (7.7)
No	502 (92.3)
Is there any person >60 years in your home?	
Yes	277 (50.9)
No	267 (49.1)
Are there any children <12 years in your home?	
Yes	140 (25.7)
No	404 (74.3)

Table 2: Prevalence of levels of depression, anxiety, and stress among health-care workers (*n*=544)

Outcome	Normal, *n* (%)	Mild, *n* (%)	Moderate, *n* (%)	Severe, *n* (%)	Extremely severe, *n* (%)
Depression	419 (77)	53 (9.7)	50 (9.2)	14 (2.6)	8 (1.5)
Anxiety	503 (92.5)	22 (4.0)	16 (2.9)	3 (0.6)	0
Stress	469 (86.2)	37 (6.8)	25 (4.6)	10 (1.8)	3 (0.6)

stress of 4 among non-frontline workers with IQR of 10 ($P = 0.001$). The median score of depression among frontline workers was 2 with IQR of 10 compared to a median of 2, among non-frontline workers with IQR of 6 ($P = 0.02$).

Furthermore, the DASS depression ($P = 0.026$), anxiety ($P = 0.029$), and stress ($P = 0.041$) scores were significantly higher among those who had children <12 at home. The median score of depression, anxiety, and stress among health-care workers with children <12 at home were 4, 2, and 6 with IQR of 10, 4, and 12, respectively, compared to a median of 2, 1, and 4 among those who do not have children at home with IQR of 6, 3, and 10, respectively.

The symptoms of depression were higher among health-care providers below the age of 40 years. The median DASS depression score among health-care providers below the age of 40 years (2 with IQR of 8) was significantly higher ($P = 0.012$) than the median score among those above the age of 40 years (0 with IQR of 6). However, anxiety and stress had no association with the presence of elderly at home ($P > 0.05$).

The symptoms of anxiety are found to be more among those who are <40 years of age compared to those above 40 years. The median DASS anxiety score among health-care providers below the age of 40 years (1 with IQR of 3) was significantly higher ($P < 0.001$) than the median score among those above the age of 40 years (0 with IQR of 2). However, there was no statistically significant difference ($P = 0.089$) in the median DASS stress score between health-care providers below the age of 40 years (4 with IQR of 10) and those above the age of 40 years (2 with IQR of 8).

There was a significant difference in anxiety scores between different professional categories, but there was no significant difference in stress and depression scores between different professional categories. In order to find out which of the two groups showed significant difference, *post hoc* pair-wise comparison was done. *Post hoc* test showed that the anxiety scores were significantly higher ($P = 0.006$) among nurses (median = 2, IQR = 4) compared to doctors (median = 1, IQR = 3) [Table 3].

Those who have a previous history of mental illness had higher median anxiety and stress scores compared to those who do not have mental illness in the past, which was found to be statistically significant ($P = 0.011$, $P = 0.046$). There was no statistically significant difference in depression scores among those who had a previous history of mental illness ($P = 0.137$). There was no statistically significant difference in median DASS scores between different genders, marital status, types of hospital, seniority level, and the presence of elderly at home.

For variables that were found to be statistically significant, the anxiety, stress, and depression levels were categorized into two groups (normal and mild as Group 1 and the rest as Group 2) to estimate the measure of effect OR and 95% CI.

Frontline health-care workers have higher risk of having stress (OR = 2.04 [95% CI: 1.03–4.03, $P = 0.04$]), anxiety (OR = 3.3,1 [95% CI: 17–9.29], $P = 0.024$), and depression (OR = 2.386 [95% CI: 1.42–4.006], $P = 0.001$) compared to those are not a frontline worker. Those who have children <12 years at home had 98.8% more risk to have stress (OR = 1.988 [95% CI: 1.006–3.928], [$P = 0.048$]).

Emotional or social support from family and colleagues is associated with stress ($\chi^2 = 13.37$, $P = 0.001$) and depression ($\chi^2 = 6.977$, $P = 0.031$) but not associated with anxiety ($\chi^2 = 5.921$, $P = 0.052$). Emotional or social support from health authorities is associated with stress ($\chi^2 = 13.054$, $P = 0.001$) and depression ($\chi^2 = 14.77$, $P = 0.001$) but not associated with anxiety ($\chi^2 = 2.700$, $P = 0.259$).

Univariate analysis by binary logistic regression revealed that emotional or social support from family and colleagues is a protective factor for stress and depression.

We have clubbed the different categories of independent variable emotional and social support into two groups, "Not at all/A little" category as Group 1 and "much/very much/extremely" category as the Group 2. By keeping Group 1 as the reference category, it is found that those who have got enough emotional or social support from family and colleagues have 75% less stress (OR = 0.249; 95% CI: 0.109–0.570) compared

Table 3: Result of *post hoc* comparison for anxiety score

Pairs	Test statistic	SE	Standard test statistic	*P*	Adjusted *P* value
Doctor versus nurse	−63.103	20.438	−3.088	0.002	0.006
Doctor versus paramedics	−27.735	17.66	−1.576	0.115	0.345
Paramedics versus nurse	36.367	24.729	1.430	0.153	0.458

SE: Standard error

to the Group 1. By considering depression as the dependent variable, it is found that Group 2 has 57% less depression (OR = 0.427; 95% CI: 0.204–0.894) compared to Group 1.

Next, we did the binary logistic regression by taking stress as the dependent variable and emotional and social support from health authorities as independent variable. Here also, we clubbed the categories into Group 1 and Group 2 as before and did the binary logistic regression. Those who have got emotional and social support from higher health authorities have 71% less stress compared to Group 1 (OR = 0.291; 95% CI: 0.146–0.578). There is 64% less depression in Group 2 compared to Group 1 (OR = 0.364; 95% CI: 0.212–0.625).

Finally, multiple logistic regression was done using stress as dependent variable, and independent variables are those which are found to be significant in univariate analysis. The results revealed that stress is associated with emotional and social support from higher health authorities with $P = 0.022$ (OR = 0.404; 95% CI: 0.186–0.878). Multiple logistic regression analysis by keeping depression as the dependent variable yielded two variables frontline workers ($P = 0.027$; OR = 1.844; 95% CI: 1.073–3.167) and emotional and social support from health authorities ($P = 0.006$; OR = 0.432; 95% CI: 0.238–0.782) as a significant.

DISCUSSION

In this study conducted among 544 participants, 21.5% had depression, 7.5% had anxiety and 13.8% had stress.

In a review study done by Chou *et al.*, it is reported that the proportion of health-care workers who had moderate or severe depression was 14%–15%, while 12%–24% had moderate-to-severe anxiety.[3-5,11] The lower prevalence in anxiety could be due to the lower case load of COVID-19 in Kerala during the study period, and the health authorities could limit the COVID-19 transmission to a level which can be managed by the health system. The prevalence was even higher in a study conducted in china, where 50.4% of participants reported symptoms of depression and 44.6% reported having anxiety.[3] Medical health workers had prevalence rates of 13% of anxiety, and 12.2% depression compared to 8.5% and 9.5% among nonmedical health workers in another study.[12]

In our study, the frontline health-care workers in COVID-19 control had higher odds of having depression. In a study, Lai *et al.*[3] also report that frontline health-care workers engaged in COVID-19 control were associated with a higher risk of symptoms of depression (OR: 1.52; 95% CI: 1.11–2.09; $P = 0.01$), anxiety (OR: 1.57; 95% CI: 1.22–2.02; $P < 0.001$). In the above study, nurses reported more severe degrees of mental health symptoms than other health-care workers (e.g., median [IQR] Patient Health Questionnaire scores among physicians vs. nurses: 4.0 [1.0–7.0] vs. 5.0 [2.0–8.0]; $P = .007$). In our study also, nurses had a higher anxiety scores ($P = 0.006$) than doctors (among nurses with median 2 [IQR: 4] vs. doctors median 1 [IQR: 3]). In a study by Tan *et al.*, it was found that the prevalence of anxiety was higher among nonmedical health-care workers than medical personnel (20.7% vs. 10.8%, $P = 0.011$).[13]

In our study, there was no difference in mental health outcome between male and female ($P > 0.05$), but women had higher anxiety median score in a study by Lai *et al.* with Generalized Anxiety Disorder scale scores among men versus women: 2.0 (0–6.0) versus 4.0 (1.0–7.0); $P < 0.001$. However, some studies reported men to have more depression.

Mohindra *et al.*[14] also suggests some positive emotional support that health-care workers need to be given such as validation and appreciation by colleagues, supportive and proud family and colleagues, positive role models in senior colleagues and peers, and appreciation and gratitude of patients.

Emotional and social support from family and colleagues is found to be a protective factor for stress and depression, when univariate analysis was done.

Cai *et al.*[15] also report that the safety of family has a high impact in reducing staff stress ($P = 0.37 > 0.05$) in health-care workers. Another important factor to reduce staff distress during the outbreak is the positive attitude from their colleagues ($P = 0.04$). Song *et al.* also reported

that lower level of social support as a risk factor for developing depressive symptoms.[16]

Being a frontline worker is a risk factor and emotional and social support from higher health authorities is a protective factor for depression.

Limitation

The study was conducted with an online survey as the country is under complete lockdown during the study period. Hence, though we got participation from all districts in Kerala, we could not ensure equal participation from health-care workers from all districts. Furthermore only participants who have access to the internet could participate in the study, hence restricting the generalizability.

RECOMMENDATION

As the case load of COVID-19 increases, there is a need to protect the health-care workers. Special interventions which are comprehensive, persistent, and continuing measures for preventing the mental health issues in health-care workers is the need of the hour, which need to be available for long term into the future. The health-care professional, who is involved in saving lives thousands of people, especially the frontline workers, nurses, and those who are younger age, need particular attention in their mental health and well-being. More studies on the mental health and well-being of health-care workers are required in future.

CONCLUSIONS

Health-care workers reported experiencing poor mental health outcomes, especially frontline health-care workers who are directly involved in the screening, diagnosis, treatment, and care for patients with COVID-19. Emotional and social support from higher health authorities is a protective factor against depression and stress among health-care workers.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Evaluating the effectiveness of a verbal autopsy workshop: A comparative analysis of pre- and posttest

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Abstract

Introduction: AIIMS Delhi developed an online platform Mortality in India established through Verbal Autopsies, which ultimately provides data on the cause of death in the country. AIIMS Patna being one of the partner institutions in this initiative of AIIMS Delhi, thus, conducted a 2-day workshop of Registrar General of India supervisors with the objective to strengthen the knowledge of participants and improve their practices on writing a good narrative during verbal autopsy (VA) using a key symptom list.

Materials and Methods: A total of 32 participants attended the 2-day workshop at the Department of Community and Family Medicine, AIIMS Patna, in January 2019. A pretest questionnaire was administered before the start of the workshop and to test the improvement in knowledge of participants after attending the workshop, the same questionnaire was again administered as a posttest at the end of the workshop. Feedback of participants was also collected on a predesigned semi-structured questionnaire. The collected responses were entered in MS Excel 2010. Descriptive and inferential statistics were calculated using SPSS version 16.0 software.

Results: There was a statistically significant improvement ($P < 0.001$) in the mean posttest score (8.6 ± 1.2) as compared to the mean pretest score (6.1 ± 2.8). Maximum participants, i.e., 15 (46.8%), reported that filling VA forms in a narrative way was the most useful part of the workshop. All the participants, i.e., 32 (100%), strongly agreed that the workshop was appropriately organized, content of the training was relevant, they were encouraged to actively participate, and adequate material was provided.

Conclusion: Further intensive workshop with more field training and refresher training at regular intervals is expected in future.

Keywords: Cause of death, posttest, pretest, verbal autopsy

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INTRODUCTION

Reliable information about the cause of death (COD) is one of the most pivotal factors in the planning of health intervention besides optimal use of already scarce resources, especially in a developing country like India.[1,2] The mortality information in India is not complete as most deaths occur outside the health system, which remains undocumented and is not captured for the medical certification of COD.[3] For the last 40 years in India, the sample registration system (SRS) is providing an estimate of annual vital statistics including the COD.[4] However, the SRS is based on a fairly representative sample spread across all over the country, and India is still lagging behind from attaining universal birth and death registration. Furthermore, assigning COD to approximately 50,000 identified annual death in the

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sampling units is challenging.[4] In addition, the COD ascertained under SRS is of unreliable genuineness as it is reported by any near relative at the time of registration.[5] Thus, an alternative method is the need of the hour to supplement information on mortality. Globally, verbal autopsy (VA) methods have been utilized to determine the COD, especially for low-resource settings.[6,7] For incorporating VA into SRS of Registrar General of India Office, the apex institute AIIMS Delhi developed an online platform Mortality in India established through Verbal Autopsies (MINErVA), which ultimately provides data on COD in the country. In the VA method, close caregivers of the deceased are interviewed by RGI supervisors and the information is filled in a predesigned form. The filled form is then scanned and is reviewed by trained physicians to arrive at the COD in the form of standard international classification of diseases-10 coding.[8] AIIMS Patna being one of the partner institutions in this initiative of AIIMS Delhi, thus, conducted a 2-day workshop of RGI supervisors with objectives of strengthening the knowledge of participants and improve their practices on writing a good narrative during VA using key symptom list and to assess the effectiveness of the workshop in improving the knowledge of the participants, by comparing the pre- and posttest.

MATERIALS AND METHODS

A 2-day training workshop on VA was conducted for RGI officers at the Department of Community and Family Medicine, AIIMS Patna, in January 2019. Prior to the workshop, a meeting was organized with the Directorate of Census Operations, Bihar, officials to finalize the agenda for the workshop. A total of 32 participants attended the workshop and were going through the training for the first time. The workshop comprised in-house training on the 1st day followed by field training on the next day. The in-house training comprised six sessions covering the topics on VA forms, key symptoms, writing a good narrative/documentation during VA using key symptom list, communication and interviewing skills, good interviewing skills, and evaluation and critique of VA narratives and medical documents. These sessions were followed by the mock VA interviews (role play) and discussion on improving narratives. On second day, a field visit was organized for all the participants, which was followed by debriefing of the field exercise (case narration and inference) and verbal discussion on narrative features (good/ bad). With the approval from competent authorities, this study was conducted to compare the effectiveness of the training workshop among the participants. Informed verbal consent was obtained from the participants. Thereafter, a pretest questionnaire containing 15 multiple choice questions with a single correct answer covering the key points of various topics included in the session was administered before beginning the workshop. To test the improvement in knowledge of participants after attending the workshop, the same questionnaire was again administered as a posttest to all the participants at the end of the workshop on the next day. A time of 15 min was provided to every participant for filling each pre- and posttest. Participants scoring <60% marks were considered as low performance and >60% were considered as high performance. In the end, the participants were requested to provide their feedback. A predesigned semi-structured questionnaire containing both open- and close-ended questions pertaining to the most useful part of the workshop, feedback on the conduction of the workshop, was used to collect the participant's feedback. The quantitative response for feedback on the conduction of the workshop was measured on a 3-point Likert scale. Declaration of Helsinki had been followed throughout the research work.

The collected responses were entered in MS Excel 2010. Descriptive and inferential statistics were calculated using Statistical Package for the Social Sciences (SPSS Inc. , Chicago, State of Illinois, United States) version 16.0 software. The qualitative data were expressed in frequency and percentages.

RESULTS

There was a statistically significant improvement ($P = 0.001$) in the mean posttest score (8.6 ± 1.2) as compared to the mean pretest score (6.1 ± 2.8) [Table 1]. Further, 20 (62.5%) participants achieved >60% marks in the posttest as compared to 9 (28.2%) participants who achieved <60% marks in the pretest ($P < 0.01$) [Table 2]. Maximum participants, i.e., 15 (46.8%), reported that filling VA forms in a narrative way is the most useful part of the workshop followed by knowledge about symptoms and disease (9 [28.1%]), theoretical and practical aspects covered (5 [15.6%]), and interviewing technique (2 [6.2%]), whereas only 1 (3.1%) reported that queries answered in a simple way is the most useful part [Figure 1]. All the participants, i.e., 32 (100%), strongly agreed that the workshop was appropriately organized, the content of the training was relevant, they were encouraged to actively participate, and adequate material was provided [Table 3], whereas maximum participants, 31 (96.8%), strongly agreed that the resource persons were interested in making them learn. On asking gains received from the

Table 1: Comparison of mean score achieved (*n*=32)

Evaluation	Mean score	SD	95% CI	Test of significance (paired *t*-test)
Pretest	5.9	2.7	4.9-6.9	t=6.12, df=31, P<0.001
Posttest	8.9	0.94	8.5-9.2	

CI: Confidence interval, SD: Standard deviation

Table 2: Pre-post evaluation categorization (*n*=32)

Evaluation	<60% marks, *n* (%)	≥60% marks, *n* (%)	Test of significance (Chi-square test)
Pretest	23 (71.8)	9 (28.2)	χ^2=6.30, P<0.01
Posttest	12 (37.5)	20 (62.5)	

Table 3: Feedback on conduction of workshop (*n*=32)

Items in the workshop	Strongly agree (%)	Agree	Disagree
Organization was appropriate	32 (100)	0	0
Content was relevant	32 (100)	0	0
Involvement of participants was encouraged	32 (100)	0	0
Materials were adequate	32 (100)	0	0
Resource persons were interested in making us learn	31 (96.8)	1 (3.1)	0

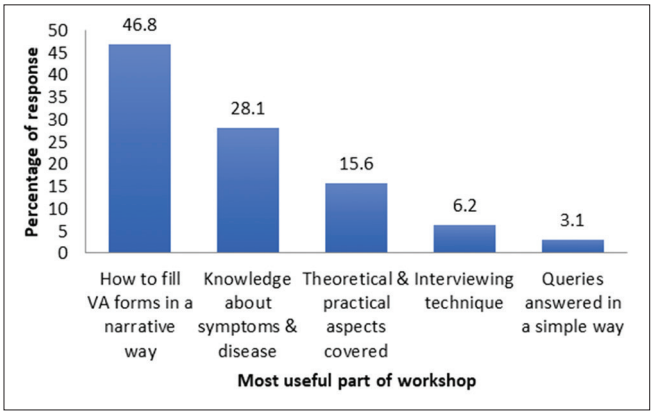

Figure 1: Feedback reported from participants on the most useful part of the workshop

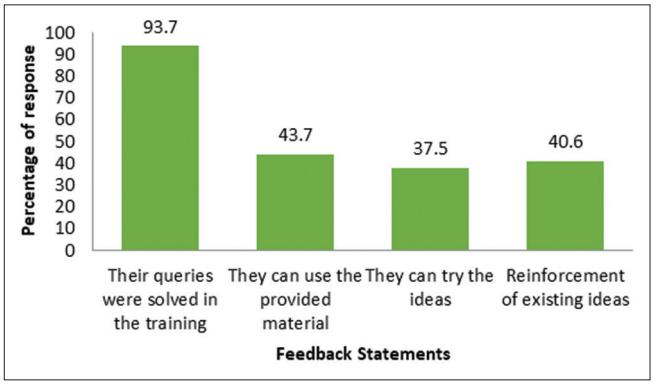

Figure 2: Feedback on gains from the workshop

workshop, maximum (93.7%) were satisfied that their queries were solved in the training, followed by 14 (43.7%) and 12 (37.5%) mentioning that they can use the provided material and try the ideas for their fieldwork, respectively, whereas 13 (40.6%) felt that there was a reinforcement of existing ideas [Figure 2].

DISCUSSION

VA method application in Minerva encompasses interview of the close caregiver of the deceased to recollect the sign, symptoms, and events preceding death followed by writing a narrative which incorporates the key symptoms. The narrative is then judged by two independent physicians to diagnose the COD. Thus, writing a good narrative is a significant prerequisite to reach a suitable and accurate diagnosis, as the latter is subjective in nature. In this context, the current workshop attempted to provide an formal learning and assessment platform for acquiring skills to conduct a VA in the field. The current study noted significant improvement in the knowledge of participants after completion of the workshop. Simultaneously, the number of participants acquiring >60% marks also increased in the posttest as compared to the pretest. Thus, this gain precisely determines that administering a pretest before the beginning of a workshop aids in increasing the concentration and keenness of the participants all along the workshop. On the other hand, the participants feel more confident by the end of the workshop which is evident by positive improvement in their posttest score. Similar to our findings, Biswas *et al*.[9] also concluded that perhaps the pretest increases the eagerness and curiosity to pay attention during the lecture. Also, study conducted by Uma,[10] reported that including multiple-choice questions in the pretest helps the students to focus better on key points, and posttest helps to recall the important points delivered in the lecture. A similar conclusion was noted by Mandla *et al*.[11] and Jayachandran *et al*.[12]

The strength of the current workshop was role-playing and field training which imparted "hands-on" practice to

the participants, hence ensured the active involvement of the participants which was further also acknowledged by them in their feedback. Similarly, Grip de and Pleijers[13] also mentioned in their study that combining theoretical lectures with "hands-on" training in the sessions leads to an active exchange of ideas and contributions by the participants.

The objectives of the workshop were successfully met as almost all the respondents provided positive feedback on the conduction of the workshop and maximum (93.7%) could solve their queries in the workshop. Although, few participants mentioned in the feedback that more field trainings are required so these kind of workshop in future, should be extended for two more days. Thus, the feedback from the participants not only brings satisfaction to the facilitator for their work but also yields insight into the future scope.[14]

Limitation of the study

A small number of participants in the workshop limit the generalization of the result. Moreover, a 100% positive response to some questions of the feedback points towards social desirability bias.

CONCLUSION

The workshop was successful in imparting participants with the skills to conduct a VA in their field area. However, further intensive workshops with more field training and refresher training at regular intervals should be conducted in future.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

First few cases of COVID-19 admitted in a teaching hospital of North Kerala – Insights gained on the clinico-epidemiological presentations, management and patient perceptions on transmission dynamics

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Abstract

Introduction: The first case of COVID-19 in India was confirmed in Kerala on January 2020, with the state effectively crushing the epidemic curve.

Objectives: This study aims to describe the clinico-epidemiological profile and transmission dynamics of confirmed COVID-19 cases admitted in our health care facility.

Materials and Methods: A case series study of 19 laboratory-confirmed cases in the early pandemic phase was done (13th March–April 9th 2020). Information on sociodemographic variables, exposure histories, clinical symptoms, and treatment were collected from case records and in-depth telephonic interviews. Descriptive analysis of selected variables was done. Incubation periods and receipt of infection were estimated from patient histories.

Results: About 78.9% were male, in the age group of 22–86 years (Median-42 years). 18/19 (94.7%) of laboratory-confirmed cases were imported, half of them from UAE. Fever and cough were the predominant symptoms, followed by sore throat, breathlessness, headache, muscle pain, and loose stools with majority (85%) reporting mild symptoms. Five patients were asymptomatic. Mean duration from symptom onset to reporting is 4 ± 4.47 days. Two patients developed complications, one requiring hemodialysis and ventilator support. About 42% of patients had at least one comorbidity. Mean duration of symptom clearance and hospital stay was 6.76 days and 19.41 ± 6.801 days, respectively. Virological clearance was noted in 13.06 ± 7.32 days.

Conclusions: Epidemiological findings from these cases aided in prompt public health responses across the districts in Kerala.

Keywords: Clinical profile, COVID-19, epidemiology, first few cases, India, North Kerala

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INTRODUCTION

The detection and spread of COVID-19 as a localized outbreak in China and later into pandemic proportions is accompanied by uncertainty over the key epidemiological, clinical, and virological characteristics of the novel pathogen and particularly its ability to spread in the human population and its virulence.[1]

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The outbreak was identified in Wuhan, China, in December 2019.[2] The World Health Organization declared the outbreak to be a Public Health Emergency of International Concern on 30 January 2020, and recognized it as a pandemic on March 11, 2020.[3,4] On January 30, 2020, a laboratory-confirmed case of 2019-nCoV was reported in Kerala in a student returning from Wuhan, followed by three cases between January 30, and February 3, 2020.

Our health care facility initiated screening and collecting samples for testing from February 12, 2020. On January 24, isolation facilities were set up in the hospital with 12 beds and facilities upscaled periodically based on national guidelines.[5,6]

It is essential to understand the epidemiological, clinical, and virological characteristics of the First Few cases of COVID-19 to inform targeted guidance and measures for our districts public health response.[7] Few international and national studies have been published based on preliminary findings on epidemiology of COVID-19. To treat new infections and prevent further transmission, it is necessary to analyze and share epidemiological data of the cases reported from our setting. Our aim is to describe the epidemiology, transmission classification, transmission dynamics, and clinical presentation of first 19 cases admitted in the early phase of the pandemic.

MATERIALS AND METHODS

We did a case series study of all 19 laboratory-confirmed COVID-19 infections admitted at our health facility during the early pandemic phase. Relevant information of all cases from March 13, 2020 to April 9, 2020 were collected. Standard operational definitions of suspect case, confirmed case, asymptomatic transmission, recovered case, and incubation period were utilized for case inclusion and analysis.[8-10] The research was approved by the Institutional Ethics Review Committee.

Data collection

We elicited requisite information from two sources, secondary data from hospital records and personal in-depth telephonic interviews. Details of clinical symptoms, exposures, contact with confirmed case(s), and preexisting conditions were collected. Results of reverse transcription-polymerase chain reaction (RTPCR) from respiratory PCR Specimens were accessed from the hospital records. Epidemiological data were gathered from the risk assessment tool developed by our team in the COVID-19 triage zone. This data were cross checked with data in the case sheets for completeness.

In symptomatic patients, IP was calculated from time of exposure to onset of clinical symptoms. In asymptomatic patients Incubation period was modeled based on exposure histories. Time of possible exposures was ascertained from patients version as majority had a travel history. Secondary attack rates were calculated by constructing detailed route maps of the patients and identifying all primary and secondary contacts having exposed to the case from the date of arrival.

RESULTS

Of the 19 cases, 15 were men (78.9%) and 4 were women (21.1%). Cases ranged from 22 to 85 years with a median of 42 years (interquartile range [IQR] = 20), with 14 (73.6%) in 30–59 age category. Three patients were aged 60 and above. All cases belonged to the Muslim community. A spatial clustering of cases along the coastal belt of the district was noted on geographical mapping [Figure 1].

18/19 (94.7%) of cases were imported fitting (now revised as "Cluster of cases") into the transmission classification of the WHO.[10] One case fitted into the local transmission category. Case-P12 was a faith healer who had direct contact with his son who returned from Umra pilgrimage to Mecca on 11/3/20, who chose to remain in home quarantine without reporting the symptoms to the surveillance system. P12 is also reported to have had multiple contact with believers who had returned from abroad seeking spiritual help. Of the 18 cases, 12 were imported from abroad and 6 of them had a history of interstate travel [Table 1].

Purpose of travel

Nine of the imported cases had been residing in middle east. Two cases reported travel for Umra pilgrimage to the holy cities of Mecca and Medina and had transited through Jeddah. Six of them had participated in religious gatherings in Delhi and Mumbai in the month of February and March. One was a student from Edinburgh, Scotland. Locations in UAE were Hamdan street, Abudhabi, Deira Dubai, Naif, an Arabic souk in Dubai.

Symptoms

6/12 (50%) travellers reported symptoms before arrival. A similar proportion either continued to have symptoms or developed symptoms on arrival. About 90% had symptoms on the date of reporting to health facility. 9/12 (75%)

reported symptoms during home quarantine/isolation in the hospital [Table 1]. Table 1 denotes the location and number of cases based on symptom reporting and symptom onset.

Initial symptoms reported by patients are fever (11 patients, 57.89%), sore throat ($n = 4$ patients, 21%), cough or sputum production (6 patients, 31.57%), breathlessness (2 patients, 10.5%), and muscle ache (1 patient, 5.2%).5 (26.3%) patients reported no symptoms falling into the asymptomatic category.

14 cases (73.7%) experienced symptoms on reporting to hospital. The recorded symptoms on admission were fever, sore throat, cough, breathlessness and headache, and muscle pain and loose stools as depicted in Table 2.

Mean duration from symptom onset to reporting to health facility among symptomatic is calculated as 4 ± 4.47 days (median-2.5 days).

Clinical (P2 and P12) and radiologic evidence of pneumonia were noted in 3 patients. 1 patient(P15) was asymptomatic but Chest X-ray showed right lower lobe alveolar shadow.

12/14 (85.7%) patients exhibited mild symptoms, with two cases progressing to complications. P12 turned critical requiring hemodialysis and ventilator support.

Based on revised guidelines (24/3/20) by ICMR, screening of cases and categorization of all cases at the time of admission was done in the COVID-19 outpatient department.[11]

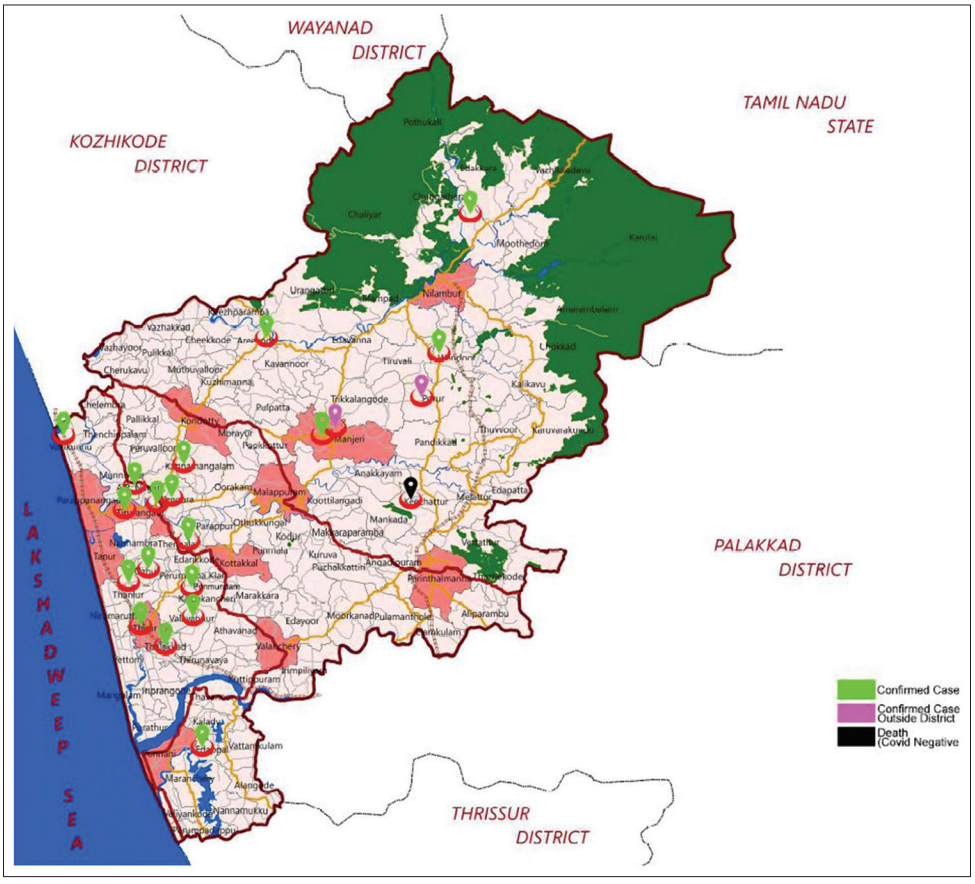

Figure 1: Geographical mapping of first confirmed cases in Malappuram district

Table 1: Location and number of cases based on symptom reporting and symptom onset

Country of exit with location	Dates of arrival	Number of travellers	Symptomatic				
			Before arrival (*n*) +/−	On arrival (*n*) +/−	On the date of reporting to health facility (*n*) +/−	During home quarantine/ hospital isolation (*n*) +/−	Asymptomatic
Abudhabi	19/3	1	+(1)	–	–	–	
Dubai	18/3-22/3	8	+(2)	+(3)	+(8)	+(7)	
Saudi Arabia	9/3-12/3	2	+(2)	+(2)	+(2)	+(2)	
UK	18/3	1	+	+	+(1)	–	
Interstate travel							
Mumbai	23/3/20	2	–	-		-	+2
Delhi	11/3-13/3	4	+(1)	–		-*	+3

Figure 2 illustrates the time line of first throat swab and blood sample collection for confirmation.

A steady influx of confirmed cases is illustrated in Figure 2. The interval between hospital admission and RTPCR positivity (based on first sample) ranged from 1 to 7 days (Median-2 days). Interval between collection of first- and second-negative sample ranged from 2 to 3 days.

Mean duration of being symptomatic is 6.76 days (Median-4 days, IQR = 1–26 days) from the date of contact with health facility [Figure 3]. The mean duration of hospital stay following virological clearance was 19.41 ± 6.801 days (median-20 days) based on two consecutive negative throat swabs in an interval of 24 h.

Comorbidities

About 42% of patients (8/19) had at least one comorbidity [Table 2]. P2 reported COPD and P12 had diabetes, hypertension, and previous history of CAD.

TREATMENT DETAILS: All patients were administered oseltamivir and hydroxychloroquine following the interim treatment guidelines.[11] 12/19 received azithromycin, with two in this group receiving moxclav and piptaz in addition. Lopinavir and ritonavir was started on compassionate grounds with state medical board approval on two patients with critical presentations. Rapid X-ray clearance and symptomatic improvement was noted within a day into treatment on lopinavir and ritonavir.

However, Case P12, developed acute coronary syndrome followed by acute kidney injury, sepsis, and multi organ failure and died after 18 days of admission and 9 days after virological clearance.

Symptom clearance and virological clearance

We calculated transmission dynamics of the disease based on actual date of symptom onset fitting into case definition of COVID-19 from patient version. Based on this, the minimum and maximum IP estimated [Figure 3].

Events such as clinical recovery and virological clearance can be interpreted from the graph. X axis "0" denotes the day of reporting to health facility [Figure 3]. Virological clearance from the date of reporting is noted to be 13.06 ± 7.32 days (median-13 days).

Lab parameters

Liver function test and renal function test (RFT) were noted to be within normal limits for all the patients at admission. P12 showed derangement of RFT on day 13 of admission. Chest X-rays were evaluated for opacities indicative of pneumonia. Neutrophil to lymphocyte count was estimated in17 out of 19 patients. 5 out of 17 patients (26.3%) had a high N/L ratio of 3.5 and above. In both patients who had a severe presentation N/L ratio was high.

Table 2: Demographic and symptom characteristics of first few cases (*n*=19) reporting to health facility

Variable	*n* (%)
Age (years) (*n*=19)	
19-29	2 (10.5)
30-59	14 (73.6)
60-69	2 (10.5)
70-79	-
80-89	1 (5.2)
Gender (*n*=19)	
Male	15 (78.9)
Female	4 (21.1)
Travel history (*n*=18)	
International	
UAE	9 (50.0)
Saudi Arabia	2 (11.1)
United Kingdom	1 (5.5)
Interstate	
Mumbai	2 (11.1)
Delhi	4 (22.2)
Symptoms on admission (*n*=14)	
Fever	11 (78.57)
Sore throat	4 (28.57)
Cough	6 (42.8)
Breathlessness and headache	2 (14.28)
Muscle pain and loose stools	1 (7)
Categorization based on screening (*n*=19)	
Category A	3 (15.78)
Category B	10 (52.6)
Category C	1 (5.26)
Asymptomatic	5 (35.7)
Comorbidities (*n*=19)	
Diabetes	3 (15.7)
Hypertension	2 (10.5)
Coronary artery disease	2 (10.5)
Bronchial asthma	1 (5.2)
Multiple comorbidities	2 (10.5)
Complications postadmission (*n*=19)	
Pneumonia	2 (10.5)

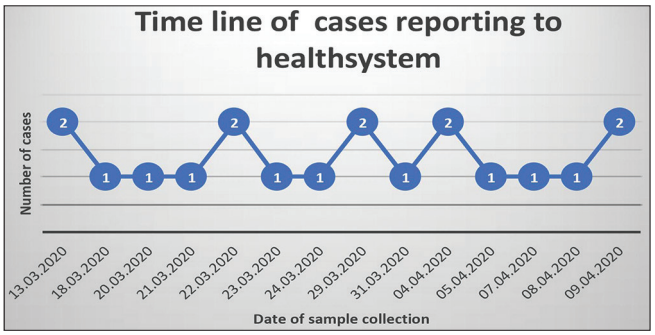

Figure 2: Time line of case reports to health facility

Secondary infection rate (SIR) and secondary clinical attack rate

The total number of primary and secondary contacts for the 19 confirmed cases traced out by District health

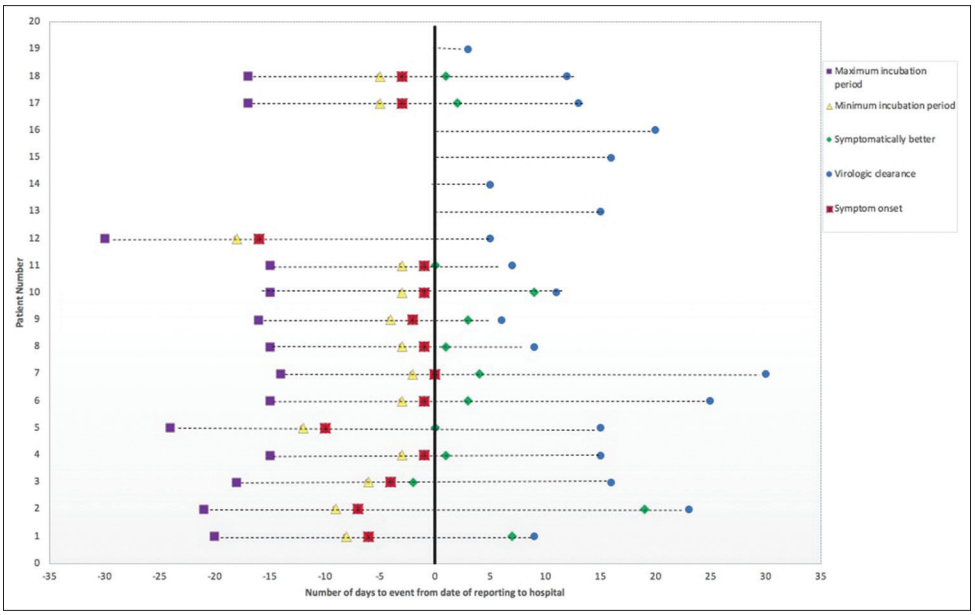

Figure 3: Transmission dynamics of COVID-19 cases

administration was 1743 and 5211, respectively. Around 8% of contacts on home quarantine reported symptoms. All the close primary contacts were tested. None of them reported positivity.

DISCUSSION

The median age group of patients (42.6 years) is similar to the Delhi and South Korean study.[12,13] Relative higher age groups were reported from China and in WHO report.[14-17]

Male preponderance was (78.9%) similar to the Delhi figures (66.7%), concordant with studies from China and Korea. The sex ratio among the confirmed cases globally reported is 1.03:1 (WHO).[12,13,17]

All cases belonged to the Muslim community, which is the predominant religion in the district (70.24%).[18] A spatial clustering may be due to sharing common exposures such as engaged in job overseas and religious gatherings [Figure 1].

Transmission in the countries based on the WHO situation report

About 50% of cases were from UAE, corroborating with the fact that UAE had started to report with 4 cases from late February reporting local transmission. Almost 70% of the active cases at the moment in Kerala have links to Naif, a large commercial market in Dubai, where the laborers are cramped into one room. Two cases returning from Saudi Arabia might have contracted infections during pilgrimage from hot spot countries in February, especially Iran.[19]

By the 16th of March, 171 cases had been confirmed in Scotland from 4895 tests[20] These findings of the initial clusters relating to import of cases is similar in many countries, points to the ability of this virus to spread far and wide in a short span of time.

All 12 cases had been screened at the airport, those reporting symptoms were directly transferred to health facility for swab collection followed by admission, and the rest were placed under home quarantine. Through a strong decentralized system of daily case reporting and surveillance symptoms were ascertained by twice daily telephonic enquiry and suspects were transported to the facility in designated ambulance available in the toll free number, through DISHA, the 24-h tele-health helpline.[21] A team of trained students and faculty from our institution actively participated in disseminating specific health awareness messages for asymptomatic travelers send for home quarantine.

Six cases related to Interstate travel reported participating in gathering of a particular religious sect in Delhi and Mumbai. All of them had multiple interactions with believers at various points of the journey.[22]

Fever as the initial and most associated symptom as noted in our setting is consistent with the findings from multiple studies. Substantiating the observations evolving globally, 86% of cases had mild symptoms and all of them responded to conservative management.[14-16,23] Unlike the Chinese and Korean study, Chills were not reported in our cases as in the Delhi study.[14]

Multiple studies have documented age as a significant risk factor for complications and mortality as evidenced by the complications reported among 2 elderly patients in this study too.[16,24,25]

About 26.3% of cases fell into the asymptomatic category and this cluster was noted among pilgrims with interstate travel. Studies from Diamond Princess cruise ship, New York city and China's National Health Commission reports asymptomatic infection as 51·7%, 87.9%, and 78%, respectively.[26-29] Moreover, transmission before the onset of symptoms has been reported.[30-32]

The mean duration of being symptomatic was 9.3 days (2–34 days) and median duration, 5 days from the date of hospital admission based on patient version in our study, similar to a Chinese observation.[33,34] Mean duration of hospital stay was 19.41 ± 6.801 for the cases, akin to the finding from a Beijing hospital.[35]

Though we had 2 cases on lopinavir and ritonavir exhibiting rapid clinical improvement, these are individual case reports and needs to be viewed with caution, considering the susceptibility to bias for observational studies.[36] There are some preliminary evidence of the effectiveness of lopinavir/ritonavir against other coronaviruses.[37,38] However, a recent randomized trial has not found any benefit over time from the use of these drugs.[39] Chloroquine has also been evaluated in individual studies and may have a role in the management of COVID-19 in times to come.[40]

Virological clearance in this study is similar to reports from China.[40] Data from clinical and virologic studies that have collected repeated biological samples from confirmed patients provide evidence that shedding of the COVID-19 virus is highest in upper respiratory tract (nose and throat) early in the course of the disease and may be more contagious.[40-42] This may be the reason for low transmissibility of infection among the primary contacts in our study. However, few cases have been reported in which patients infected their close contacts even after "apparent recovery" from the infection.[30,43,44]

Most importantly, experts claim that RT-PCR positivity is not be synonymous with infectivity. The possible reasons argued by a large number of experts are related to several virological, immunological, and sampling methodological factors. Virologically, the false negatives, viral residual, intermittent viral release, and viral distribution are usually considered to be major factors.[45-47] RT-PCR is positive when viral RNA sequences tested are present in the sample and can be amplified and thus detected. This can happen several weeks after the disease onset and many days after the patient has become asymptomatic. Usually, in such cases, the viral RNA copy numbers are low. Such cases do not represent the infective stage. Infectivity of a sample is indicated by the ability to culture the virus from it. Alternatively, RT-PCR for subgenomic mRNA can detect cells in the active replicating phase and so presumably infective.[48]

In this preliminary study, we tried to gain early understanding of key clinical, epidemiological, and virological characteristics of the first cases of COVID-19 infection detected in Malappuram district of Kerala state. This investigation helped to compare and contrast the findings from the cases admitted in our settings to the rapid and superfluous information evolving from several countries globally.

Results highlight the imported nature of the early pandemic in Kerala and India. We emphasize stringent screening, testing, isolation, and institutional quarantine of international and interstate travelers during postlockdown in Kerala. Testing for asymptomatics from high risk zones should be done on the 5th and 14th days, prior to release from quarantine to halt local spread.

Kerala state has reported persistent RTPCR positivity for symptomatic and asymptomatic travellers on sentinel surveillance drive. Considering the available research evidence and the findings from our study, we consider RTPCR positivity not to be synonymous with infectivity. This may serve to create panic in the community and place heavy burden on the limited resources, which may be diverted to improve the surge capacity of health care institutions as well as testing, contact tracing and quarantine.

As there was no community transmission during the study of these cases. Hence, we presume that the decentralized model of early COVID-19 containment has been successful in Kerala and may be emulated in the national context.

CONCLUSIONS

This case series of 19 laboratory-confirmed cases in the early pandemic phase helped us understand the epidemiological, clinical, and virological characteristics of a novel pathogen at a time when scarce regional data were available. Findings were disseminated across targeted guidance to aid treatment and districts public health response. The findings added value in treating new infections and preventing further transmission. We emphasized stringent screening, testing,

isolation, and institutional quarantine of international and interstate travelers during postlockdown in the district and highlighted the imported nature of the early pandemic in Kerala. Our conclusion is that decentralized model of early COVID-19 containment in the first phase of the Pandemic in Kerala is successful and may be emulated in the national context.

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Conflicts of interest

There are no conflicts of interest.

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Original Article

Coverage assessment of maternal and child health services provided at Urban Health and Nutrition Day in urban slums of Jamnagar Municipal Corporation area

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Abstract

Introduction: Urban Health and Nutrition Day (UHND) is an initiative to provide preventive, promotive, and curative maternal and child health services monthly on fixed day. It is mainly designed to reach out to those who are living in urban slums and for serving vulnerable. The study was conducted to assess the utilization of services provided to mother and child at Mamta session.

Materials and Methods: A cross-sectional study was conducted in urban slums of Jamnagar. In the first stage, 30 Anganwadi centers were chosen by systematic random sampling, and in the second stage, 8 postnatal women with 8 children were included.

Results: Out of 240 participants, 80% of women registered their pregnancy at Mamta session and 86% were having Mother and Child Protection Card at the time of visit. Basic health checkups containing blood pressure and weight were measured for around 90%, three-fourth of women were checked for hemoglobin % and urine for albumin, and only 29% were done with abdominal examination. Health education component was found to be much-sidelined portion of UHND session in both mother and child care in this study. From surveyed children, 81.6% were registered at session site; from those registered, 62% attend the session regularly; 80% of children were weighed; only 12% of children's weight was recorded in Mamta card; and 50% of mothers were explained about weight and its interpretation. Fifty-four percent of women had given colostrum to their babies, and the same proportion of mother gave prelacteal feed to their children.

Conclusion: There is a need to sensitize health workers about the importance of giving health education to mothers which is found to be the most poorly executed component of the study.

Keywords: Anganwadi center, Mamta session, maternal and child health services

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INTRODUCTION

National Urban Health Mission (NUHM) had been launched in 2013 for providing primary health services to an urban vulnerable population. The framework of the NUHM envisages the provision of outreach services targeted to slum dwellers and other vulnerable groups.[1]

The monthly outreach sessions/Urban Health and Nutrition Days (UHNDs) are organized along the line of

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the Village Health and Nutrition Day under the National Rural Health Mission. These are organized to cater population living in slums/vulnerable within the catchment area of an urban primary health center to ensure universal coverage for a set of basic curative and large basket of preventive and promotive services. The UHND is also an occasion for health communication on a number of key health issues; it is usually observed once a month at Anganwadi center (AWC) or school or any other available space for community work.[1] The primary focus of organizing UHND session is to provide health services to the urban poor and address the disparity of health services in an urban part.[2] UHND sessions also known as Mamta divas had been initiated under the umbrella of Mamta Abhiyan since 2006 in Gujarat to reach population mostly residing in urban slums.

The key beneficiaries of Mamta day are women of reproductive age group, pregnant women, postnatal women, and children under 5 years.

Maternal and child health (MCH) indicator among slum people shows that their health is 2–3 times worse than in urban areas.[3] Drawing upon the findings of the National Family Health Survey (NFHS), it was concluded in many studies[4,5] that although health indicators in urban areas are better than rural population, there is vast disparity in these indicators if we compare between urban poor and nonpoor populations in terms of status of MCH care indicator in all over India as well as in all states. WHO report published for SEAR (South East Asian Region countries) found the utilization of Antenatal, Postnatal, skilled birth attendant and family planning services low in slum setting as compared to non slum area; the same scenario is of high infant mortality rate, under-five mortality, and low utilization of child health services.[6]

Various studies have shown that inadequate utilization of MCH services among the urban poor, particularly the slum dwellers, leads to high MMR, undernutrition, poor immunization, and infant morbidity and mortality.[7-10] The study was conducted with an objective to assess the utilization of services provided to mother and child at UHND sessions.

MATERIALS AND METHODS

Jamnagar city is situated in Saurashtra region of Gujarat, being known as oil city of India; it has witnessed a lot of industrialization, and due to this, a large number of people are migrated from all over India, leading to increased slum population. A cross-sectional study was conducted in urban slums located in Jamnagar Municipal Corporation area to see the utilization of MCH services provided at UHND sessions. The study is a part of another big study to evaluate the utilization of UHND services among all beneficiaries, conducted for 1 year in 2016.

A cross-sectional study was conducted in urban slums located in Jamnagar Municipal Corporation area to see the utilization of MCH services provided at UHND sessions.

The research study includes mothers who had delivered child within 1 year at the time of data collection and children in the age group of 0–6 years. Only those participants who were residing in catchment area of chosen AWC and beneficiary of AWC were included in this study.

Two-stage sampling methodology was adopted. A complete list of Anganwadi centers of Jamnagar urban area was taken from Integrated Child Development Services (ICDS) office; there were around 297 Anganwadi centers in the study area. For sampling purpose, a ward wise alphabetically listing of all the 297 AWCs was arranged; then, in the first stage, 30 AWCs were chosen from 297 AWCs by using systematic random sampling, and in the second stage from each chosen AWC, 8 mothers and 8 children (0–6 years) were chosen randomly in the study. The participants were included at household level in this study.

Sample size was calculated by using standard formula $n = 4pq/l^2$ where n is required sample size and P is proportion of interest that we considered 50% for evaluating coverage of both MCH services separately, with 10% absolute precision, so minimum estimated sample size was 100. Design effect of 2 is taken; a 20% safety margin was added to allow for a maximum estimated nonresponse; it gave a sample size of about 240. Because we considered evaluation of mother and child services separately, we chose 8 postnatal mothers and 8 children from each selected AWC.

For including the required number of participants in the study, first house in selected AWC was chosen by randomly considering last two digits from currency note present with investigator as proxy for household number and the household having that number was taken as first household for including mother and child. Starting from that house every eligible mother and child were included from subsequent houses till required number of participants found. In case Anganwadi. Participants were inquired about their sociodemographic characteristics; assessed for

utilization of maternal and child health services provided at Mamta Divas with emphasize being given to assess the counseling component of UHND sessions.

Ethical clearance and data collection

The study proposal was approved by the institutional ethics committee. A house-to-house survey was done to collect the data using a predesigned and pretested semi-structured questionnaire for 1 year. Before starting actual study, a pilot testing was conducted to see the comprehension of questionnaire among beneficiaries and refining them for easy administration. Informed consent was taken from each participant before administering questionnaire.

Statistical analysis

Data entry and analysis were done using Epi Info version 3.5.4 CDC (Center for Disease Prevention & Control) Atlanta, Georgia, US. Results were expressed in terms of percentages and proportion.

RESULTS

Table 1 shows the sociodemographic characteristics of 240 postnatal women surveyed in this study. Majority of the women were in the age group of 20–29 years, and 2.9% of pregnancies were found to be in adolescent age. The proportion of illiteracy was found to be as high as 25%. Majority of the women (94.2%) were homemakers and economically dependent which may reflect adversely on their health-seeking behavior. Majority of the women were belonging to Hindu religion (63.3%) and living in joint family system (59.6%). It was observed that majority of women, i.e., 79.6%, belong to lower socioeconomic class (class III, IV, and V) and 20% of women were belonged to higher socioeconomic class (class I and II) by using BG Prasad classification. The study revealed that around 23% of women in the study area had their first child before the attainment of legal age of marriage and around one-fourth of the study population had a family size more than 2.

Table 2 shows the utilization of maternal health services provided at AWC on Mamta divas. Eighty-six percent of women had Mamta card during visit, and the most commonplace (80%) of registering pregnancy in slum was found to be Mamta session. After assessing Antenatal services that include weight and blood pressure measurement, hemoglobin estimation(Hb%) and abdominal examination; it was found that only weight and BP measurement was carried out in most of the AWCs; only weight and BP measurement services are provided in most of AWC; three-fourth of women were checked for Hb%, urine for albumin, and sugar; abdominal examination was conducted on 30% of women. We also assessed about getting benefits of supplementary nutrition to beneficiaries (ANC, PNC, children and adolescents) that is provided at AWCs under ICDS programme. In this study, we found that only 62% were provided with take-home ration (THR) at least once in their ANC period, and out of them, only 24% had been provided with adequate number of packets.[6] The coverage of early registration was only 60% in the study area, and around 10% of pregnancies were not at all registered in any facility. Around 30% of women registered pregnancy either in the second or third trimester. Less than 50% of women had the desired number of ANC visits which show the weakness in reaching beneficiaries.

Out of 190 women who registered in Mamta session at AWC, around 60% of women had been provided with 100 or more iron and folic acid (IFA) tablets; it could be due to their infrequent visit to sessions. For ascertaining the services provided to mother, we recorded most of the findings from Mamta card only. Coverage of complete immunization in pregnancy was 90%; 60% of women got the full ANC care (≥4 antenatal visit, consumption of 100 or more IFA tablets, and at least one doses of tetanus toxoid injection) in the study area; around 88.88% of women were delivered in

Table 1: Sociodemographic characteristics of the study population

Variables	Postnatal women (*n*=240), *n* (%)
Age	
15-19	7 (2.9)
20-24	118 (49.2)
25-29	79 (32.9)
≥30	36 (15)
Maternal education	
Illiterate	59 (24.6)
Primary	28 (11.7)
Secondary	46 (19.2)
Higher secondary	98 (40.8)
Graduate and above	9 (3.8)
Type of family	
Nuclear	89 (37.1)
Joint	143 (59.6)
Three generation	8 (3.3)
Social class*	
Social class 1	12 (5.0)
Social class 2	37 (15.4)
Social class 3	74 (30.8)
Social class 4	95 (39.6)
Social class 5	22 (9.2)
Religion	
Hindu	152 (63.3)
Muslim	88 (36.7)
Age at first conception (years)	
≤18	55 (22.9)
>18	185 (70.1)
Parity	
≤2	182 (75.8)
>2	58 (24.2)

*Modified BG Prasad classification used for social class

Table 2: Coverage of maternal health services provided at Anganwadi center on Mamta session (village health and nutrition day)

Availability of health services	*N*/*n* (%)
Mamta card	
Yes	207 (86.3)
No	33 (13.8)
Place of registration	
Mamta session	191 (79.6)
Government tertiary care center	53 (22.1)
Private hospital	28 (11.7)
Basic health services	
Weight measurement	180/191 (94.2)
Blood pressure	176/191 (92.1)
Hemoglobin	145/191 (75.9)
Urine (albumin sugar)	138/191 (72.2)
Abdominal examination	56/191 (29.3)
Supplementary nutrition provided	
Provided	118/191 (61.7)
Adequate (>6 packets)	29/118 (24.5)
Inadequate (<6 packets)	89/118 (72.8)
Antenatal visit	
≥4	78/191 (40.8)
<4	113/191 (59.1)
Time of registration (*n*=240)	
First trimester	146 (60.8)
Second trimester	64 (26.6)
Third trimester	5 (2.08)
Not registered pregnancy	25 (10.4)
IFA provided (tablets)	
≥100	117/191 (61.2)
<100	74/191 (38.7)
Immunization against tetanus toxoid	
Not immunized	7/240 (6.3)
Fully immunized	218/240 (90.8)
Partially immunized	15/240 (2.9)
Full ANC care	
Yes	114/191 (59.6)
Place of delivery (*n*=240)	
Institutional	213 (88.8)
Home	
Trained personnel	18 (7.5)
Untrained Dai	9 (3.7)

IFA: Iron and folic acid, ANC: Antenatal care

Table 3: Assessment of antenatal care counseling at Urban Health and Nutrition Day sessions

Antenatal counseling at Mamta session (*n*=191)	*n* (%)
Danger signs of pregnancy	
Vaginal bleeding	100 (52.3)
Swollen hand and feet	47 (24.6)
Blurring of vision	7 (3.6)
All three dander signs	10 (5.2)
Family planning advice	59 (30.8)
Nutritional counseling	135 (70.6)
Counseling related to birth preparedness	121 (63.3)

health-care facility. 11.3% of women were delivered at home of which 67% were conducted by trained Dai and 33% of home delivery was conducted by untrained Dai.

In Table 3, apart from giving basic health services, promotive and preventive care has a special emphasis in UHND session. Hence, we also included various domains of ANC counseling in this study. Only 5% of women were aware about all three danger signs of pregnancy. Thirty percent of women got the advice regarding family planning; 70% of women had been counseled for taking adequate nutrition in pregnancy and postnatal period. Sixty-three percent of women were counseled for birth preparedness.

In Table 4 among children included in the study, around 81% were registered at Mamta session in AWC. Among registered children, only 62% had regularly attended the session every month. It was found that 80% of children were weighed in their last visit; 50% of mothers were explained by the health workers about weight and what does it mean by falling of child in a particular color zone. Mothers were also asked about feeding practices at birth; it was found that around 54% of mothers had given prelacteal feed (honey, jiggery, sugar water, and water) to child immediately after birth because some of them considered this as a ritual and others in misbelieving that there is no milk immediately after delivery. Fifty-four percent of mothers had given the first milk that is colostrum to their babies; it indicates that there is an increase in need of creating awareness among mothers about feeding of their child.

We also include the status of counseling of mothers about child care; it was checked whether mother had been counseled about nutrition, hygiene, danger sign, and knowledge about oral rehydration salt (ORS) preparation. 57% had been given nutritional advice about children related to exclusive breast feeding, correct food and timing of introduction of complementary feeding. Then, 40% had been advised about hygienic practices (nail cutting of both mother and child, handwashing of duo before feeding the child, and using clean utensil for taking food); 60% of mothers had been able to describe the correct method of preparation of ORS. Very few, i.e., 36%, were aware about the danger signs (irritable child, fast breathing, nasal flaring, yellow palm, and sole) as per Integrated Management of Neonatal and Child Health Services.

DISCUSSION

The study included 240 mothers and 240 children to assess the utilization of MCH services provided at UHND session. The first thing that is given to mother in her first visit to avail health services is Mother and Child Protection Card and is an important card for documenting all the services utilized by mother and child and used for follow-up of services. The study found a good number of mothers (86%) who had Mamta card and registered themselves at Mamta session. It was also

Table 4: Utilization of child health services at Mamta session

	N/n (%)
Registration and attendance of children at Mamta session	
Children registered at Mamta session	196/240 (81.6)
Children regularly attend the session; every month	122/196 (62.24)
Growth monitoring	
Weight measurement in last visit	157/196 (80.1)
Weight recorded in Mamta cord	20/157 (12.7)
Explain the weight and its interpretation to mother	80/157 (50.09)
Breastfeeding parameter	
Colostrum given	131/240 (54.5)
Prelacteal feed given	130/240 (54.1)
Health education of mother by ANM/AWW	
Nutrition advice (exclusive breastfeeding and complementary feeding)	111/196 (56.6)
Advice about hygienic practices (handwashing before feeding)	80/196 (40.8)
Knowledge of how to prepare ORS solution	119/196 (60.7)
Danger sign as per IMNCI	71/196 (36.2)

ANM: Auxiliary nurse midwife, AWW: Anganwadi worker, ORS: Oral rehydration salt, IMCI: Integrated management of childhood illness

observed that women of study area are availing maternal services at more than one facility may be due to easy accessibility in an urban area. The finding of District Fact Sheet of Gujarat (NFHS-4) 2015–2016[11] shows that 93% of women had MCP card in an urban area; difference in finding could be due to the present study that was conducted only in urban slums. Pai *et al.*[12] in slums of Karnataka and Neyaz *et al.*[4] in slums of Aligarh found a similar proportion of women utilizing government facility for registering their pregnancy.

The proportion of women conceived before legal age of marriage was found to be as high as (23%); similar findings were found in District Fact Sheet of Jamnagar (NFHS-4);[11] this warranted the need of proper implementation of law as well as more community outreach to create awareness among population.

The proportion of home deliveries was 11.7% in study area; among them 3.7% were conducted by untrained dais; there is a special need to map out those areas where home deliveries are high and persisting because it was observed that some selected areas were having more proportion of this practice.

It is expected that women should be provided with some basic health checkups regularly in every visit which include BP, weight measurement, and abdominal examination along with periodic Hb% estimation and urine for albumin and sugar in the last trimester. These sets of services would ensure the prevention of complication in early stage. In the present study, BP and weight were measured of more than 90% of mothers, three-fourth of mothers were checked for Hb and urine for albumin and sugar, but the abdominal examination was conducted in only 30% of mothers; it could be because of lack of required skills in auxiliary nurse midwife which indicate the need to conduct a more robust training program for health workers for effective delivery of services at primary level. In studies by Gandhi *et al.*[13] in an urban slum of Surat and Pati *et al.*[14] in Orissa and Mehta *et al.*[15] in Vadodara, nearly all studies found good coverage of weight measurement and similarly low coverage of abdominal examination; the rest of the health services varied from study to study.

Pregnant and postnatal women are provided with supplementary nutrition in the form of THR under ICDS program. A study found that only 24% were provided with adequate number of packets. NFHS in Gujarat (2015–2016)[16] also found that around 30%–35% of ANC and PNC mothers were provided with supplementary nutrition. Hence, the efforts of the government are not really translating into action, and in spite of functional since long, there are large lacunas in implementing the delivery of program that arise the need of interrogation at delivery level.

The coverage of IFA tablets, injection tetanus, and full ANC care was found more than NFHS-4 finding, which may be due to regional difference in coverage. An important component of UHND session is to provide preventive and promotive health services to beneficiaries; to accomplish this, there should be series of session on mother and child care in every monthly meeting. Counseling about danger sign of pregnancy, family planning, nutritional advice, and birth preparedness are some of the important ANC topics to be discussed at UHND, findings of the present study found counseling being the most neglected portion in UHND. Various studies conducted on Mamta session in Gujarat and other states[14,15,17] found a similar scenario of health education.

Behavior change communication (BCC) is the key to sensitize population, and if done consistently, it will lead

to major reform in health condition of population and need to be strengthened.

Growth monitoring is an important component of tracking child nutrition and it helps in identifying any deviation of anthropometric measurement from normal at right time and timely intervention can be given to child. Poor weight record maintenance on Mamta card was observed; only 12% children weight was recorded by health worker; it is actually a missed opportunity to detect early abnormality and further follow-up. A study conducted in an urban slum of adjacent city found a similar list in growth monitoring, but documentation was found to be more (61%) than the study finding.

Limitation of the study

The main limitation of the study was that the findings of study was entirely based on quantitative survey to assess the maternal and child health services provided at UHND but the reasons behind the low coverage of services could be explored by using qualitative methods of survey and would be very important to find out supply side and demand side barriers hindering the utilization of services that was not explored in this study.

CONCLUSION

In spite of functioning of the program for a long, the services provided to beneficiaries are average with promotive components of health the most neglected component. The observations indirectly indicate that quality health services were inadequate although coverage was relatively high sensitizing the need for improving the services provided by health-care workers and to build up their capacity by way of in-service training in the matters of MCH components.

There is a need to sensitize the health worker to effectively implement BCC activities during outreach session through periodic training.

The present study also prompted us to explore the reason behind low coverage of services, barriers, and facilitators of executing services to suggest remedial measures.

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Conflicts of interest

There are no conflicts of interest.

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Short Communication

An online study to assess the disposal of personal protective equipment at home amid COVID-19 pandemic in India

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Abstract

Introduction: In the current COVID-19 pandemic, when most of cases are asymptomatic or mild, and being kept on home isolation, personal protective equipment (PPE) used by them is potentially infectious and needs to be treated like biomedical wastes. The objective of the study is to assess the disposal of PPE used by general public in the current COVID-19 pandemic in India.

Materials and Methods: This was a 1-week online cross-sectional descriptive study conducted among residents of India, in the age group of >18 years. The sample was convenient. The study tool was online self-designed, semi-structured, pretested, and self-administered questionnaire.

Results: A total of 559 study subjects were analyzed. Maximum (77.8%) subjects were of age 18–40 years with almost equal proportion of male and female. Overall satisfactory disposal of PPE was done by 9.7% of subjects.

Conclusion: The PPE disposal in the community is not satisfactory despite majority of the study participants claimed to be aware of PPE disposal guidelines.

Keywords: COVID-19 pandemic, disposal of personal protective equipment at home, personal protective equipment

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INTRODUCTION

COVID-19 disease has a wide spectrum from asymptomatic cases, mild-to-moderate cases, to serious and severe acute respiratory illness. With an incubation period of 2–14 days, patients are most infectious during the initial days of infection when symptoms are mildest or not present. These titers have been the highest at the time of patient presentation, and viral levels are just as high in asymptomatic or presymptomatic patients.[1,2] The disease is transmitted by either direct contact with COVID-19–positive cases or surroundings or objects rendered infectious by them. Further, the duration of stay of virus on different objects is different (4 h to 3 days).[3,4]

In the absence of any treatment and highly effective preventable vaccine and based on the current COVID-19 epidemiology, infection control measures are the only effective measure we have till now. Infection control measures being focused upon are frequent hand washing and use of personal protective equipment (PPE). Wearing these PPE while in home isolation, home quarantine, and even if we are stepping in public places is rendering these potentially infectious. Hence, these should be considered as infectious waste and should not be disposed of in general waste without any disinfection treatment. These infectious wastes can be a major threat to our sanitation workers and rag pickers, and subsequently, they could be the carriers of infections in the community.

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Hence, biomedical waste management is one of the key components of infection control measure that must be strictly implemented in hospitals as well as at home to curb COVID-19 spread. The current COVID-19 pandemic has revealed this issue of home-generated biomedical infectious waste, and so, on March 20, Central Pollution Control Board (CPCB), India, came up with the guidelines for collection and management of home-generated biomedical waste for home-isolated COVID-19–positive patient, which quoted that disposal of infectious waste such as mask or tissue would be done in separate yellow bag and that would be collected by local authorities.[5] Recently, May 11, 2020, Ministry of Health and Family Welfare (MOHFW), GOI, has come up with the guidelines for disposal of waste at home during home quarantine and home isolation.[6,7]

Hence, the study was conducted to assess the disposal of PPE used by public in the current COVID-19 pandemic in India, with the aim to request authorities for generation of IEC material for management of home-generated biomedical waste.

MATERIALS AND METHODS

The present study was an online cross-sectional descriptive study carried out over a period of 1 week in the month of May 2020 among residents of India, in the age group of >18 years. Inclusion criteria were residents of India, age group >18 years having, access to internet and having e-mail id or e-mail id of any person in the family, who could comprehend with English and Hindi, and who gave consent for the study. We excluded those who by any means found difficulty in understanding the language of the form and did not have access to internet and/or not have e-mail id of any person in the family.

Study subjects were enrolled by direct recruitment. Phone directory of all supervisors was used, and their contacts were contacted through phone call and consent was taken. E-mail id of the contacted person or any family member was taken. In addition, phone numbers of their phone directory were asked with consent from them for further enrolment of study participants. One member of the family was contacted via e-mail id and included in the study. The sample was convenient, and all subjects enrolled in 1-week study period and qualified inclusion criteria were included.

The study tool was pretested, self-designed, semi-structured, and self-administered online questionnaire. The form was designed in Google Forms, and the link of the questionnaire was sent to one member of the family via given e-mail id. First section of the form was participant information sheet and next is consent. If participant further gave consent for the survey, then he/she could go to the next section of infection control measures and disposal of PPEs at home, current status of the family in terms of living in containment zone area, any COVID-19–positive patient in the family on home isolation, and any family member on home quarantine. In addition, details related to source of their information regarding disposal of used PPE were also collected.

Statistical analysis

Primary outcome variable was satisfactory disposal of PPE at home. Satisfactory disposal of PPE has been categorized as per "Biomedical Waste Guidelines by CPCB" and "Revised guidelines for Home Isolation of Very Mild/Presymptomatic COVID-19 Cases" and "Guidelines for Home Quarantine: by MOHFW 2020." This has been further individualized for each PPE such as face mask, gloves, head cover, and body gown.

Satisfactory disposal of face mask, head cover, and body gown has been considered if these were disinfected using ordinary bleach solution (5%) or sodium hypochlorite solution (1%) and then disposed of either by burning or deep burial whereas for gloves, satisfactory disposal was considered if disposed of in yellow biomedical waste bag.

"Overall satisfactory disposal" includes satisfactory disposal of all the PPEs that were being used by the study participants.

Data were entered in excel and analyzed in SPSS Statistics for Windows, version 16.0 (SPSS Inc., Chicago, Ill., USA). Proportions were calculated for qualitative data. Subgroup analysis was done for healthcare and nonhealthcare personnel. Chi-square test and Fisher's exact test have been applied accordingly. A $P < 0.05$ was considered statistically significant.

The ethical approval has been taken prior conducting the study from the institutional ethics committee. Study questionnaire was sent online with a brief patient information sheet explaining about the study and associated risk or benefits. Confidentiality and privacy were taken care. Informed consent was taken before starting the study questionnaire on Google Form. Study tool was designed in a way that after submission of their response, a brief knowledge of handling of home-generated biomedical waste as per current knowledge was disseminated via e-mail.

RESULTS

The study was carried out for 1 week and a total of 564 study participants were enrolled. Out of those 564, 5 did not give consent for the study. Finally, 559 study subjects were analyzed.

Out of 559 respondents, maximum (77.8%) were in the age group of 18–40 years. Male (47.9%) and female (52.1%) equally participated in our study. Majority (77.5%) were graduates and postgraduates followed by 12th pass (18.8%). There was a good mix of various profession including healthcare personnel (18.4%). Majority (64.6%) participants were from metro city.

Table 1 shows proportion of satisfactory disposal of PPE at home among healthcare personnel and nonhealthcare personnel. A total of 556 subjects were analyzed in this as three subjects did not respond for these questions. Face mask was used by almost all the study subjects (556), gloves used by 57.9%, head cover used by 24.6%, and body gown used by 19.9%. Overall satisfactory disposal of PPE was done by 54 (9.7%) study subjects.

Satisfactory disposal of PPE was followed by 7.3% of subjects living in containment zone, while none of the subjects with COVID-19–positive patients in the family and 6.1% of subjects with any member on quarantine in the family were practicing satisfactory disposal of PPE.

Majority (70.3%) subjects reported that they were informed about guidelines related to PPE Disposal at home. Main source of information was online (61.9%) and news (55.8%) [Table 2].

Out of total 391 subjects who had information regarding guidelines related to PPE disposal used during COVID-19, 11.8% of subjects reported satisfactory disposal of PPE at home.

DISCUSSION

This study was carried out to address the issue related to disposal of PPEs used by public including those on home isolation and home quarantine for COVID-19 disease. In the present study, all (100.0%) study subjects reported use of face mask. Few nonhealthcare workers also reported use of gloves (44.2%), head cover (14.7%), and gown (11.5%), which is not recommended for public.[8] Overall satisfactory disposal of PPE was practiced by only 9.7% of subjects. This pattern of unsatisfactory disposal was also seen among healthcare personnel (19.7%). Most common practice followed among study subjects was directly throwing of these PPE in the public or home dustbin (49.6%) followed by washing with detergent before disposal in public dustbin (26.7%). Few subjects (16.1%) reported that they did not dispose PPE at all. The situation was even worse among subjects with COVID-19–positive patient in family and those on quarantine as none of the family with COVID-19–positive patient disposed PPE as per the guidelines, and only 6.1% of subjects with family member on home quarantine disposed PPE properly.

In the present study, awareness about PPE disposal guidelines during COVID-19 was reported by 70% of subjects, but out of those, only 11.8% of subjects followed PPE disposal guidelines which show a huge gap in knowledge and practice of PPE disposal. Important source of information for the participants was online and news. Arogya-Setu app was reported by only one study participant contrary to the fact that the app has been downloaded by majority Indian population as mandated by the government.

Limitation

The study has been carried out online, and study subjects have been enrolled using phone directory of supervisor of the study which led to enrollment of highly educated subjects, and we could not assess the situation among illiterate and poor people.

CONCLUSION

Our study concluded that PPE disposal in the community is not satisfactory despite majority of the study participants claimed to be aware about PPE disposal guidelines. Further, there is misuse of PPE such as gloves, head cover, and gowns among study participants. There is a

Table 1: Disposal of personal protective equipment at home among study subjects

Personal protective equipment	Nonhealthcare personnel (453)		Healthcare personnel (103)		*P*
	Satisfactory	Unsatisfactory	Satisfactory	Unsatisfactory	
Face mask (556)	73 (16.1)	380 (83.9)	26 (25.2)	77 (74.8)	0.029
Gloves* (322)	3 (1.2)	243 (98.8)	10 (13.2)	66 (86.8)	0.001
Head cover** (137)	24 (29.3)	58 (70.7)	15 (27.3)	40 (72.7)	0.80
Body gown*** (111)	17 (26.6)	47 (73.4)	13 (27.7)	34 (72.3)	0.001
Overall satisfactory# (556)	34 (7.5)	419 (92.5)	20 (19.4)	83 (80.6)	0.001

*234 (42.0%) did not use gloves, **419 (75.3%) did not use head cover, ***445 (80.03%) did not use body gown, #Nonresponse 3 (0.54%)

Table 2: Information regarding guidelines of personal protective equipment disposal at home and source of information among study subjects

	n (%)
Information about guidelines related to PPE disposal at home	
No	165 (29.7)
Yes	391 (70.3)
Source of information about PPE disposal*	
Online	242 (61.9)
News	218 (55.8)
Healthcare personals	151 (38.2)
Friends, neighbor, relatives	46 (11.8)
Arogya-Setu app	1 (0.3)

*Multiple response. PPE: Personal protective equipment

need to generate awareness about mode of coronavirus transmission, rational use of PPE among general public, and proper disposal of PPE at home or community settings.

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Conflicts of interest

There are no conflicts of interest.

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Short Communication

Prevalence of tobacco use and associated factors among Injecting Drug Users and Men who have Sex with Men

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Abstract

Introduction: Tobacco use is a leading cause of ill-health, disability, and death worldwide. The current study aimed at estimating the prevalence of tobacco use and identify factors associated with it among injecting drug users (IDUs) and men who have sex with men (MSM).

Materials and Methods: A cross-sectional study was conducted among 100 IDUs and 100 MSM each, recruited with the help of outreach workers and peer educators of Nongovernment Organizations working for them. Tobacco usage behavior was assessed using an interviewer-administered questionnaire. Epi Info software for windows (CDC Atlanta) was used to calculate proportions and evaluate the association between tobacco use and independent variables.

Results: The current tobacco use prevalence among IDUs was 91% (smokers 75%, smokeless tobacco users 45%). Similarly, the current tobacco use prevalence among MSM study participants was 48% (smokers 28%, smokeless tobacco users 32%). Around half of the current tobacco users had tried to quit tobacco in the past 12 months.

Conclusions: There is a high proportion of tobacco use among both IDUs and MSM. It is therefore of utmost importance to strengthen tobacco cessation efforts in these groups.

Keywords: Injecting drug user, men having sex with men, tobacco

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INTRODUCTION

Tobacco use is a serious public health problem leading to considerable morbidity and mortality worldwide. Tobacco users are more likely than nonusers to develop noncommunicable diseases such as cardiovascular disease, stroke, and cancer.[1] In addition, tobacco-related diseases strain the existing health-care delivery system by increasing inpatient admissions and more duration of hospital stay. To tackle this challenge, the Government of India has implemented tobacco control policies like implementing the Cigarettes and Other Tobacco Products Act, generating awareness of the dangerous effects of tobacco and helping those addicted to it in quitting.[2]

Men who have sex with men (MSM) are more likely to face stigma and discrimination in the society due to their sexual identity;[3,4] which may be linked to the norms and prejudices. Similarly, injecting drug users (IDUs) because

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of their addiction behavior find it difficult to adjust in their family and society. The feeling of being marginalized and socially isolated predispose MSM and IDUs to psychological problems such as mood disorders, self-hatred, depression, and anxiety.[5,6] Further existing literature shows that mental health problems can lead a person to adopt harmful behaviors like tobacco use.[7,8] Loneliness and being socially isolated too have been reported to increase the chance of using tobacco.[9]

The existing Indian studies on tobacco use have been conducted among different population groups such as adolescents,[10,11] adults,[12] elderly,[13] medical students,[14] and females.[15] However, to the best of our knowledge, no study on tobacco use in India has been specifically conducted among IDUs and MSM. This information if made available can help tobacco control policymakers in designing appropriate interventions tailored for this population group. In this backdrop, the present study aimed at estimating the prevalence of tobacco use and identify factors associated with it among IDUs and MSM.

MATERIALS AND METHODS

This cross-sectional study was conducted among 100 IDUs and 100 MSM in Chandigarh city of North India. Sample size estimation for both these groups (IDU and MSM) was based on an assumed prevalence of tobacco consumption as 50%, 95% confidence interval, and precision of 10%. For enrolling this desired sample size, convenience sampling methodology was followed, wherein the study participants were recruited with the help of outreach workers and peer educators of Nongovernment Organizations (NGOs) working for them. The interviewers visited the drop-in centers of the selected NGOs to enroll the study participants. Apart from this, interviews were also held at some specific locations as deemed viable by NGO staff for enrolling study participants into the study.

A questionnaire was administered to the study participants after informing them about the objectives of the study and seeking their written informed consent. An "Injecting Drug User" was defined as one who had been injecting drugs for at least once in the past 3 months. The operational definition of "Men who have Sex with Men" was men who had sex (manual/oral/anal) with other men in the last 6 months. A "current tobacco user" was one who smoked or used smokeless tobacco, at least once in the last 30 days preceding the interview. Quit attempt was assessed by asking: "During the past 12 months have you tried to stop smoking/smokeless tobacco use?" The other studied variables included sociodemographic factors (age, education, occupation, and marital status) and awarness about harmful effects of tobacco. Data were analyzed using Epi Info software for windows version 7.2.4 (CDC Atlanta, USA). It was summarized as frequencies and proportions. Chi-square test and Fisher's exact test were conducted as appropriate to determine the association of independent variables with current tobacco use. The study was approved by the Research and Ethics Committee of Medical College. Prior to fieldwork, approval was obtained from the State AIDS Control Society.

RESULTS

A total of 100 IDUs and 100 MSM each were interviewed. The mean age of IDUs and MSM was 31 ± 8.6 years and 26 ± 7.2 years, respectively. Most of the study participants were in the age group 18–30 years (IDUs = 58%; MSM = 73%), literate (IDU = 93%, MSM = 88%), and employed (IDU = 85%, MSM = 92%). Around half of them were unmarried (IDU = 50%, MSM = 60%). The mean age of initiation of smoking tobacco among IDUs and MSM was 17.9 ± 5 years and 17.5 ± 4.9 years, respectively. Similarly, for the smokeless tobacco, the mean age of initiation was 18.8 ± 5.8 years for IDUs and 19.3 ± 5.8 years for MSM.

The current tobacco use prevalence among IDUs was 91% (smokers 75%, smokeless tobacco users 45%). Only 8% of IDUs were past tobacco users and 1% never-user of tobacco. Among the 75 current smokers, 44 (58.6%) had tried to quit in the past 12 months. Similarly, out of 45 current smokeless tobacco users, 51.1% (23/45) had tried to quit in the past 12 months. The current tobacco use prevalence among MSM study participants was 48% (smokers: 28%, smokeless tobacco users: 32%). There were 8% past tobacco users and only 44% never-user of tobacco. Out of 28 MSM smokers, 17 (60.7%) had tried to quit in the past 12 months. Similarly, out of 32 MSM smokeless tobacco users, 18 (56.2%) had tried to quit in the past 12 months. Nearly all the study participants were aware that using tobacco in some form or the other can lead to illness (IDUs = 99%; MSM = 92%). The possible illnesses which may happen due to tobacco use as reported by study participants were cancer (IDUs = 69%; MSM = 61%), respiratory problems (IDUs = 44%; MSM = 24%), and oral ulcers (IDUs = 31%, MSM = 17%).

In the bivariate analysis, the current tobacco use among IDUs and MSM was not significantly related

to sociodemographic factors namely age, education, occupation, or marital status [Table 1]. Among IDUs, significantly more proportion of unemployed smokeless tobacco users tried quitting tobacco (100%), as compared to the employed counterparts (45.0%; $P = 0.049$) [Table 2].

DISCUSSION

As far as we are aware, the present study is the first from India to document the prevalence of tobacco use among IDUs and MSM. The high tobacco usage found in our study confirms their vulnerability to the harmful effects of tobacco. This finding is consistent with previous studies conducted worldwide. Shin *et al*. in Mexico reported that 89.7% of the IDUs were current tobacco smokers.[16] Similarly, Villanti *et al*. in a study among IDUs in Maryland reported that the prevalence of smoking was 92.1%.[17] Duan *et al*. in China reported that 97.8% of the IDUs were smoking tobacco.[18] In another study, Bowman *et al*. in Australia found that 84% IDUs were tobacco smokers.[19] Storholm *et al*. studied young MSM and reported that 36.3% were currently smoking cigarettes.[20] Berg *et al*. conducted a study among MSM in China and found that 65.9% were current smokers.[21]

In the present study, around half of the study participants tried to quit tobacco in the past 1 year. This depicts the willingness of IDUs and MSM in quitting tobacco and thus needs focussed tobacco cessation services. Shin *et al*. in a study reported that 20.6% of the IDUs made a quit attempt in the past.[16] Further, among IDUs more proportion of unemployed smokeless tobacco users tried quitting tobacco as compared to their counterparts. This finding may be attributed to the fact that unemployed people due to inadequate income may find it difficult to buy the tobacco product for consumption and thus abstain from its use. Similar to this finding, Nargis *et al*. studied the socioeconomic patterns of smoking cessation behavior using the Global Adult Tobacco Surveys and International Tobacco Control Surveys and reported that employed smokers were less likely to quit than their nonemployed counterparts.[22]

Table 1: Factors associated with current tobacco use among the study participants

Variables	IDU			MSM		
	Current tobacco use (*n*=100)			Current tobacco use (*n*=100)		
	Yes (*n*=91)	No (*n*=9)	*P*	Yes (*n*=48)	No (*n*=52)	*P*
Age group (years)						
18-30	53 (91.4)	5 (8.6)	1.0	31 (42.5)	42 (57.5)	0.07
Above 30	38 (90.5)	4 (9.5)		17 (63.0)	10 (37.0)	
Education						
Illiterate	7 (100.0)	0	1.0	9 (75.0)	3 (25.0)	0.06
Literate	84 (90.3)	9 (9.7)		39 (44.3)	49 (55.7)	
Occupation						
Employed	76 (89.4)	9 (10.6)	0.35	46 (50.0)	46 (50.0)	0.27
Unemployed	15 (100.0)	0		2 (25.0)	6 (75.0)	
Marital status						
Married	45 (90.0)	5 (10.0)	1.0	23 (57.5)	17 (42.5)	0.12
Unmarried	46 (92.0)	4 (8.0)		25 (41.7)	35 (58.3)	

IDU: Injecting drug user, MSM: Men having sex with men

Table 2: Factors associated with quit attempt among the study participants

	IDU				MSM			
	Smoking quit attempt (*n*=75)		Smokeless tobacco quit attempt (*n*=45)		Smoking quit attempt (*n*=28)		Smokeless tobacco quit attempt (*n*=32)	
	Yes (*n*=44)	No (*n*=31)	Yes (*n*=23)	No (*n*=22)	Yes (*n*=17)	No (*n*=11)	Yes (*n*=18)	No (*n*=14)
Age group (years)								
18-30	27 (54.0)	23 (46.0)	10 (41.7)	14 (58.3)	13 (56.5)	10 (43.5)	10 (52.6)	9 (47.4)
Above 30	17 (68.0)	8 (32.0)	13 (61.9)	8 (38.1)	4 (80.0)	1 (20.0)	8 (61.5)	5 (38.5)
Education								
Illiterate	3 (50.0)	3 (50.0)	0	3 (100.0)	1 (50.0)	1 (50.0)	2 (33.3)	4 (66.7)
Literate	41 (59.4)	28 (40.6)	23 (54.8)	19 (45.2)	16 (61.5)	10 (38.5)	16 (61.5)	10 (38.5)
Occupation								
Unemployed	9 (69.2)	4 (30.8)	5 (100.0)*	0	5 (83.3)	1 (16.7)	0	2 (100.0)
Employed	35 (56.5)	27 (43.5)	18 (45.0)	22 (55.0)	12 (54.5)	10 (45.5)	18 (60.0)	12 (40.0)
Marital status								
Married	25 (55.6)	20 (44.4)	9 (52.9)	8 (47.1)	13 (59.1)	9 (40.9)	9 (60.0)	8 (40.0)
Unmarried	19 (63.3)	11 (36.7)	14 (50.0)	14 (50.0)	4 (66.7)	2 (33.3)	9 (52.9)	6 (47.1)

*Significant $P<0.05$. IDU: Injecting drug user, MSM: Men having sex with men

The results of this study are generalizable to the studied groups. Further studies may be done across different study sites to have more information regarding tobacco use among IDUs and MSM. The limitation of the current study is its cross-sectional design; because of which the causality relationship between the independent variables and tobacco use cannot be established. Secondly, the information on tobacco usage and quit attempt could be subject to reporting or recall bias; thus leading to its under or over-reporting.

CONCLUSION

There was a high proportion of tobacco use among IDUs and MSM. Around half of them had tried to quit tobacco in the past 1 year. It is therefore recommended that IDUs and MSM should be viewed as a priority group for tobacco control efforts. Focused behaviour change interventions should be designed for them; so as to discourage tobacco initiation and encourage quit behaviour among those already using it.

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Conflicts of interest

There are no conflicts of interest.

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Case Report

Neti Kriya as a therapeutic intervention for chronic allergic rhinitis

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Abstract

Allergic Rhinitis is a recurrently occurring respiratory disorder, therefore the technique of *Neti Kriya* might be helpful to cure it. This case report describes the effect of *Neti Kriya* on a single patient of Acute Rhinitis, with the help of RQLQ, CQQ, and AEC. The patient reported to be asymptomatic post-intervention, with improved domains of RQLQ and CQQ. The raised AEC at the baseline showed normal range post-intervention. This case report showed that the regular practice of *Neti Kriya* could be effective in treating chronic AR.

Keywords: Allergic disorders, chronic allergic rhinitis, desensitization, eosinophilia, *Neti*

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INTRODUCTION

As per the allergy statistics of the American Academy of Allergy, Asthma, and Immunology, it has been observed that allergic rhinitis (AR) affects 10% to 30% of the population worldwide, and it also indicated that patients with AR have a high risk of developing asthma.[1] The pathogenesis of AR reflects in the elevated number of eosinophil granulocytes in the circulating blood. Eosinophils can modulate immune responses and allergic inflammation by releasing growth factors, cytokines, and chemoattractants.[2]

Some of the *Yogic Shuddhi Kriyas* are considered helpful to deal with allergic disorders.[3,4] Among which, *Neti Kriya* helps to decrease the symptomatology and thereby can be used as a preventive as well as therapeutic approach for AR. *Gheranda Samhita* mentions the technique of *Neti Kriya,* for the removal of disorders of phlegm (G.S.I: 49,50), and *Hathapradipika* indicated its role in curing the diseases above the shoulder region (*Hathapradipika*: II.31). It has a key role in rhinitis as it is helpful to rectify the vasomotor disturbances related to nasal pathway.[5] *Neti* decreases the eosinophil count in asthma,[6] and thus, it has a plausible role in decreasing the eosinophil count in AR. On these grounds, this case report aims to understand the effect of *Neti Kriya* on AR.

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CASE REPORT

This is a single case study of Ms. BT, a 30-year-old working woman with a history of chronic AR, since childhood. As advised by her family physician, she had been on tablet cetirizine intermittently, since many years. The medication could provide temporary relief, but the allergy would relapse with persistent recurrence, limiting her day-to-day activities. Therefore, she opted for yoga therapy. During her medical checkup, the Residential Medical Officer diagnosed her as a case of moderate intermittent AR.[7] She was advised to practice *Neti Kriya* for at least 2 to 3 months to get relief from her medical conditions. Written

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informed consent was obtained from the patient for the study and publication of this case.

Therapeutic focus

Neti Kriya was performed, followed by forceful exhalation, to expel the water that may get accumulated in the sinuses during the practice of *Jalaneti Kriya*. Participant followed the module [Table 1] for the period of 2½ months. All sessions were conducted under the supervision of Yoga Therapist.

Table 1: *Yogic Shuddhi Kriya* protocol

Yogic Kriya	Time	Period
Jalaneti	In the morning, once a day	15 days
Jalaneti	In the morning, thrice a week	2 months
Sutraneti	In the morning, twice a week after *Jalaneti*	
Forceful exhalation	Immediately after *Jalaneti* and *Sutraneti*	2.5 months

Assessment

According to the symptoms of the study participant, following standard test was conducted at two time points – T_0 (baseline) and T_1 (post) intervention.

a. Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ): internal consistency, reliability as measured by Cronbach's α, was 0.92 for RQLQ and also displayed strong construct validity reference[8]
b. A Custom-made Qualitative Questionnaire: it was a custom-made questionnaire, where the participant has to express comprehensively, her symptoms, experiences, feelings, and about her overall life before and after the treatment process
c. Absolute Eosinophil Count (AEC): the blood sample was collected by Phlebotomist and the technician processed the blood for the AEC measure.

RESULTS

Rhinoconjunctivitis Quality of Life Questionnaire

The original RQLQ measures the limitations and the impairments that are caused due to rhinoconjunctivitis. While comparing the scores, the limitations and impairments of the patient were reduced by 2.04 postintervention [Table 2].

The RQLQ data analysis, after calculating the mean of each domain, is as follows [Table 2]:

Table 2: Values of allergic rhinitis symptoms at two time points

RQLQ domains	Pre (T_0)	Post (T_1)
Activities	2.33	1
Sleep	2.33	1.33
Nonnose/eye symptoms	2.14	0.14
Practical problems	2.67	0.67
Nasal symptoms	3	1
Eye symptoms	3	0.75
Emotional	4	0.25
Mean score	2.78	0.73

RQLQ: Rhinoconjunctivitis Quality of Life Questionnaire

A custom-made qualitative questionnaire

It was seen that her symptoms, impairments, and emotional traits, are perfectly corresponding to that of the RQLQ. She stated that she is feeling better after the treatment.

Absolute eosinophil count

There was a reduction in the AEC count postintervention [Table 3].

Table 3: Values of absolute eosinophil count at two time points

	Pre (T_0)	Post (T_1)
AEC (cells/cumm)	487	240

AEC: Absolute eosinophil count

DISCUSSION

This case report in a single patient showed that *Neti Kriya* effectively cures the symptoms of AR [Table 2]. After the intervention, the nasal symptoms decreased, the medication stopped, and the patient could resume her normal day-to-day activities.

Earlier research studies have shown that *Neti Kriya* induces direct physical cleansing by flushing out debris, thick mucus, allergens, and air pollutants.[9] It reduces the symptoms of AR by removal of inflammatory substances. In addition, it soothes the nasal airway.[10] It has an osmotic action and facilitates the removal of the cellular source of inflammatory mediators such as histamine and leukotriene.[11] The use of lukewarm water in *Jalaneti Kriya* leads to vasodilation, promoting phagocytosis and decreasing inflammation.[12,13] The lukewarm water also helps in nasal drainage, thereby facilitating decongestion. De Vicent[11] mentioned that *Neti Kriya* improves the function of the immune system.

In the present study, the raised AEC at T_0 [Table 3] shows an allergy-associated inflammatory condition and an ongoing event in the innate immune system as a defense for fighting the allergens. After the intervention (T_1), the AEC came within the normal range [Table 3], indicating an improvement in the allergy status.

The outcome of the present study suggests that a daily practice of *Neti Kriya* can be helpful in avoiding allergen sensitization by keeping the nose free from irritants. The repeated practice of *Neti Kriya* may help in desensitization and can perhaps be a substitute for immunotherapy treatment.

CONCLUSION

The practice of *Neti Kriya* in the patient was found to be effective in curing the symptoms of chronic AR. This study shows the effect of *Jalaneti* and *Sutraneti*, as

a combined treatment for chronic AR. However, more studies with large sample size are required to understand whether *Neti Kriya* can be used as an independent therapy or should be used in combination with other yogic practices and/or medications, as effective means for chronic AR.

Conflicts of interest

There are no conflicts of interest.

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Till we win- India's fight against the COVID-19 pandemic

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COVID-19 pandemic is the biggest public health catastrophe of the century and arguably the first in human history in the current internet age. Excess of information, the bane of current internet age compounded by the ever-evolving science of COVID-19, has confounded not only the general public but doctors and scientists also. With the plethora of information on COVID-19, a common human gets lost in the flood of the truth and the myth. This book "Till We Win - India's Fight against the COVID-19 Pandemic" is a brave attempt to cut through the mist of the infodemics around COVID-19 pandemic.

The authors Dr. Chandrakant Lahariya, Dr. Gagandeep Kang, and Dr. Randeep Guleria are renowned experts in the field of Public Health, Vaccine development, and Medicine and are at forefront of war against COVID-19 in India. The book dedicated to the ASHA workers highlights the key characteristic of India's public health system and its forbearance on volunteers. The overall framework of the book is well designed, that the readers can easily navigate the information provided in the book organised in four distinct sections.

The first section "Understanding the challenge" focuses on the epidemiology and dynamics of disease transmission, historical events of major pandemics, introducing the SARS-CoV-2 virus, discussing how the new novel virus is a bigger challenge than all previous coronaviruses, clinical characteristics of the disease, and giving a broad overview before going into further details of the novel disease.

The second section "Mounting a response" takes the readers to the joint strategies and actions taken by the Government to curb the disease spread – imposing draconian lockdown, public health interventions to break the chain of transmission by contact tracing, test-trace-test-isolate strategy, physical distancing and use of masks, and the hammer and the dance theory. This section also discusses the governance mechanisms and team approach at union and state levels, highlighting the indicative list of getting the health system ready and presenting the key role of frontline workers who never gave up in the battle against COVID-19.

The third section "Science, solidarity, and hope" provides information available on drugs and therapies, various clinical trials in the race, followed by details on the vaccines and its types, and phases of trials in vaccine development and COVID-19 vaccines that are in the line for development and approval.

The final section "Getting future ready" introduces the general public to the health system functioning and strategies for strengthening the health system amid this pandemic, and ends with preparing the people for the new-normal. The authors have acknowledged the importance of the Thai health-policy phrase "Triangle that moves the Mountain" – the mountain being any major problem, and the triangle being knowledge, people's participation, and political involvement with which any huge problem can be resolved.

The book with its greater focus on public health as compared to clinical medicine underscores the fact that the war against COVID-19 will be won in the community rather than hospitals.

The narration style of the book keeps the reader engaged and presents even highly technical topics in an easy and lucid manner. The authors provide simple yet scientifically correct definitions of many new terms, "Pandemic", "Quarantine" and "Contact tracing" that have become part of COVID-19 vernacular during this pandemic. The timeline of the pandemic has been very well captured by the authors. The authors have included real-life experiences and the fact that all three authors were directly engaged with the national response against COVID-19 does bring that lived experience from the frontline trenches to the readers of the book. The book has highlighted the principles of primary healthcare – community participation, equitable distribution, intersectoral co-ordination, and use of appropriate technology in tackling the pandemic

with stressing on community participation as the key components in fighting COVID-19. Special mention in the book of the frontline workers and their struggles is well deserved acknowledgement of the role played by them in this pandemic and is highly appreciable. It makes it easy for the readers to get the essence of each topic written by highlighting the "lessons learned during that particular period of pandemic." The "2-3-2-4" approach of COVID-19 appropriate behaviors, steps of wearing mask, steps of hand washing, three "wells" to be followed, two "connects" will make a difference in the behavior of every reader. The book has frequently asked questions that help the reader to clear all the doubts related to that topic. The "COVID-19 guidelines to be followed as you recover from the disease," mentioned in the book is the need of the hour for the readers. The authors spread hope within the readers to adapt to the new-normal and motivate them to follow healthy lifestyle behaviors.

Authors have reviewed the key strategies and actions of the government at national level in combating COVID-19; however, a more nuanced critique of the same would have been valuable addition to the book. The overtly accommodating tone of authors to the government response to COVID-19 may be found misplaced by some. The contentious aspects such as health system unpreparedness, nationwide lockdown, devastation of migrant workers livelihoods, approval of non- evidence based treatment modalities, and havoc created in the country's economy and health system should have been dealt with in greater detail by the authors.

"सचिव बैद गुर तीनि जौं प्रिय बोलहि भय आस राज धर्म तन तीनि कर होइ बेगहीं नास॥" In words of the renowned poet Tulsidas Goswami, it is duty of physician to preserve the nation by telling the truth devoid of fear and favor.

Overall, the book is simple and easy to understand that makes even the lay people understand the disease, and the authors have been quite successful in it. The book is highly recommended for those who are eager to know what happened during the initial phase of pandemic and how government addressed the challenges.

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Beti Bachao Beti Padhao Scheme, Haryana: Improvement in sex ratio at birth and other achievements

Sir,

There have been lots of discussions and deliberation among experts on the root cause of female feticide and gender biases, including strategies needed to be adopted to eliminate gender-based discrimination from society. Among various causes cited for the prevalence of sex-selective elimination, son preference, clan progress, property distribution, and fear for security of girls and women have been prominently discussed. Many social customs and traditions are thought to propagate this discrimination. Many strategies proposed by various experts range from harsher and appropriate laws, change in societal norms, and change in discriminatory traditions to raising awareness among masses.

The increased discussions, debates, and awareness on the issues related to women have direct link with the political will demonstrated through the launch of Beti Bachao Beti Padhao (B3P) Scheme from Panipat on January 22, 2015, by our Hon'ble Prime Minister in 100 districts, 87 of them being gender critical in turns of child sex ratio.[1] Haryana had 12 districts in the list of 100. Starting the program from Panipat was indeed an indication from the Prime Minister that he is concerned about the daughters of India, in general, and Haryana, in particular. He had a vision which he nicely articulated in his speech at the launch. Chief Minister Haryana was present during the launch, and he has taken this opportunity as challenge.

Though the Ministry of Women and Child Development (WCD) is the nodal ministry for implementation of B3P Scheme, the efforts of the Department of Health, Education, and other departments such as Panchayat Raj, in general, have been pivotal in its success.[2]

The indicators mentioned in guidelines released by the Ministry of WCD for deputy commissioners such as Improve the sex ratio at birth (SRB) in selected gender critical districts by 2 points in a year, At least 1.5% increase per year of Institutional Deliveries, At least 1% increase per year of 1st trimester ANC registration, Improve the nutrition status of girls by reducing number of underweight and anemic girls under 5 years of age, and Promote a protective environment for girl children through implementation of Protection of Children from Sexual Offences (POCSO) Act 2012 make this program an achievement based rather than rhetoric.[2]

Elimination of girls after birth (infanticide) has been norm in earlier days. However, after advent of new technologies especially ultrasonography which is instantaneous and relatively cheaper, knowing sex of fetus in womb has become easier.

Strict implementation of PC-PNDT, MTP, and Drug and Cosmetic Act, apart from other important measures to motivate general public, is of paramount importance in curbing the menace. Fetal sex selection has become a big industry now, and if we put pressure on one district, the industry shifts its base in nearby district. Due to this reason, Haryana Government decided to run the program in all 21 districts of the State since the beginning of the scheme. The government has come down heavily on the syndicate and has registered more than 700 first information reports (FIRs) under various acts. This has led to a sense of fear among the criminals involved in such activities. Action is being taken against quacks and other shopkeepers involved in selling fake sex-selective medicines.

The biological SRB is naturally masculine with 104–107 male live births per 1000 females, or 952 girls per 1000 boys.[3] The sex ratio in Haryana has been low historically, as depicted in Figure 1.

However, SRB for December 2015 has crossed 900 for the first time in the history of Haryana. SRB of 2016 was 900, 2017 was 914, 2018 was 914, and 2019 was 927 [Figure 2].

The aim of B3P Scheme is not only to prevent gender-biased sex selective elimination, ensuring education, ensuring survival and protection, and ensuring empowerment but also to create an enabling environment for bringing about social change, regarding equality of girl child.[2] This means a combo of activities keeping in mind whole life cycle of a woman.

Once born, a girl requires good nutrition after 6 months of exclusive breastfeeding. This will mitigate the chances

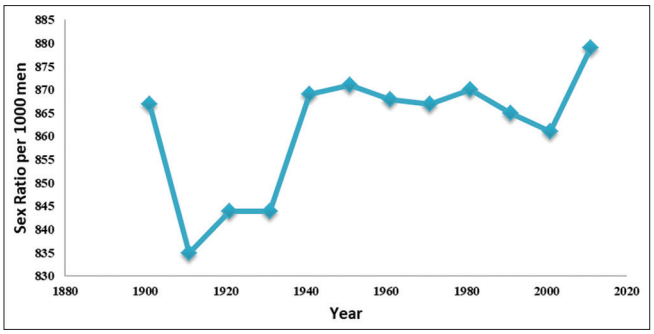

Figure 1: Sex Ratio in Haryana (1900–2011)

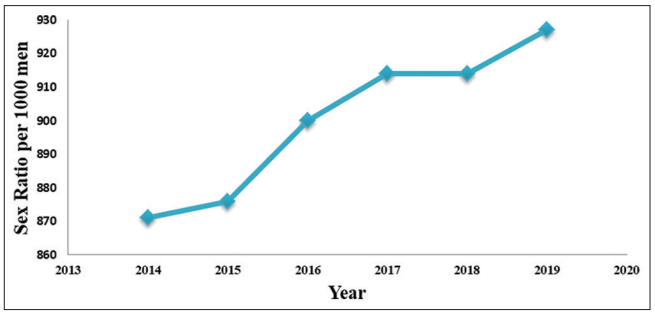

Figure 2: Sex ratio in Haryana (2014–2019)

of undernutrition in them. The latest report of NHFS 4 survey states the number of children in the age group of 6–59 months to be 71.7%. We have 29.4% underweight children in the age group of <5 years in Haryana. We can expect higher percentage of girls in these categories. Hence, our focus is on improving ICDS and diet modification in Haryana. Similarly, there has to be equal health-seeking behavior of parents for girl and boy child. Our infant mortality has reduced to 33 and under-five mortality rate has reduced to 41.[4] After preschool education in Anganwadi centers, we need to focus on 100% enrolment and less number of dropouts from schools. Balika manches and Man ki Bat in schools have brought forth some factors responsible for dropouts in girls. NSS and NCC have been involved in the program to contact dropout girls and their re-enrolment with some fantastic results. Now, we have 75.4% of women in the age group of 15–49 years who are literate.[4] Functional toilets are not only important for health and hygiene but have also documented to be helpful in increasing enrollment and decreasing dropouts among girls. We are striving to achieve availability of functional toilets for girls in all our schools. Insecurity of girls has been cited a major reason for girls elimination. They require good secure environment at home and outside. Small kids have been sensitized about bad and good touch and adolescents and adults about various legal security covers for them against harassment. Mahila Police stations have been established in all 21 districts of Haryana, keeping security of women in mind. Conviction rate under the POCSO Act cases has increased to all time high in Haryana. Referral of cases to CWC, which should be 100%, has also increased. District child protection officer monitors and reviews each POCSO Act case from registration of FIR, CWC referral, investigation, filling of challan to conduct of fair trial, and filling appeals in acquittal cases.

Various Khap panchayats have come out in open against menace of female feticide. Many civil society organizations such as Bharat Vikas Parishad are celebrating birth of girl child through initiatives such as Anandotsav. Awareness rallies, Nukkad Nataks, celebration of birth/Lohri of girls, Film shows, Prabhat pheri, Puppet shows, Signature campaign, health camps/baby shows, logo in schools and government buses, Kuan Poojan, Thali Bajana, and Gudda-Guddi boards showing the number of birth registered during the month and sex ratio of the village have been regular features now for creating awareness among masses. There has been involvement of youth in the campaign in a big way.

Various schemes such as Haryana Kanya Kosh, Pradhan mantra Matri Vandana Yojana, Aapki Beti-Humari Beti, Sukanya Samridhi, Haryana Nutrition mission, One Stop Centers, Humari Foolwari, and Malnutrition-free Haryana and awards such as Indira Gandhi Mahila Shakti Award, Kalpana Chawla Shaurya Award, Bahan Shanno Devi Award, Lifetime Achievement Award, and Women Outstanding Achievers Award have been encouraging and motivating people of the state to work for women empowerment.

B3P Scheme in Haryana has been successful due to convergence of efforts by various departments, political will, and effective implementation through deputy commissioners. The decreasing sex ratio can be brought back to normal if we take community in confidence and implement the program through people participation. The success of the scheme proves that government agencies can achieve unimaginable results through interdepartmental cooperation.

Disclosure

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Nil.

Conflicts of interest

There are no conflicts of interest.

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Forthcoming Events

1. 3rd International conference on Community Medicine & Public Health on 26th August 2021, at Galle Face Hotel, Columbo, Sri Lanka
2. 14th International Rotavirus Symposium, organised by Sabin Vaccine Institute, on 10th to 12th November 2021, at Hyatt Regency, New Delhi
3. 65th Annual National Conference of Indian Public Health Association (IPHACON), organised by Department of Preventive & Social Medicine, JIPMER, Pondicherry on 24th to 26th September 2021
4. International Conference on Non Communicable Diseases on August 05-06, 2021 in Amsterdam, Netherlands, organised by International Research Conference. Details can be accessed from: https://waset.org/non-communicable-diseases-conference-in-august-2021-in-amsterdam
5. International Conference on Prevention and Control of Rabies on July 29-30, 2021 in Zurich, Switzerland
6. 5th world congress on Disaster Management on November 24-27, 2021 at Indian Institute of Technology, New Delhi, India
7. The 28th International Workshop on Matrices and Statistics on December 13-15, 2021 at the Center for Advanced Research for Applied Mathematics and Statistics, Manipal Academy of Higher Education, (MAHE) Manipal, Karnataka, India
8. 12th IOHA International Scientific Conference (September 11 to 15, 2021) organized by International Occupational Hygiene Association (IOHA), Daegu, South Korea. Details can be accessed from: https://ioha2021.org/index.php?gt=pro/pro01