Indexed with IndMED
Indexed with MedIND
Indian Citation Index (ICI)

ISSN 0971-0876
RNI 50798/1990
University Grants Commission 20737/15554

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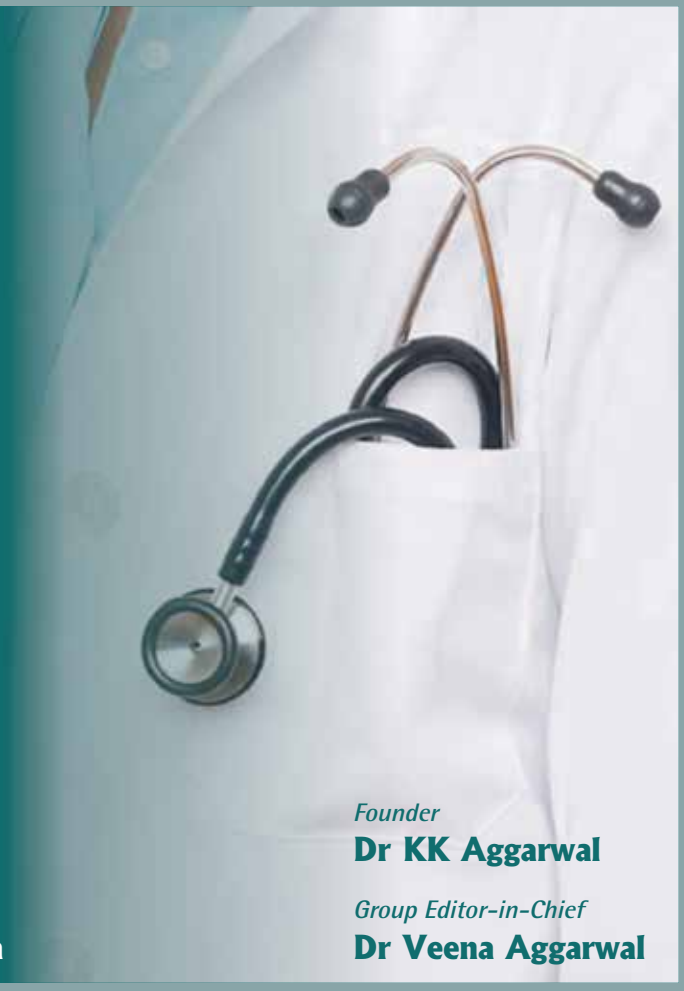
Indian JOURNAL of CLINICAL PRACTICE

A Multispecialty Journal

Volume 33, Number 10 March 2023, Pages 1–60 **Single Copy Rs. 300/-**

Peer Reviewed Journal

In this issue



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Indian JOURNAL of CLINICAL PRACTICE
A Multispecialty Journal
Volume 33, Number 10, March 2023

Published, Printed and Edited by
Dr Veena Aggarwal, on behalf of
IJCP Publications Ltd. and
Published at
3rd Floor, 39 Daryacha, Hauz Khas Village,
New Delhi - 110 016
E-mail: editorial@ijcp.com

Printed at
New Edge Communications Pvt. Ltd., New Delhi
E-mail: edgecommunication@gmail.com

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Sleep Quality and Premature Mortality

Young people who have good sleep quality are at lower risk of premature mortality, all-cause or due to cardiovascular disease (CVD), cancer or other causes, compared to individuals who have poor sleep quality. These findings from a new study were presented at the American College of Cardiology's Annual Scientific Session held in New Orleans earlier this month.[1,2]

A total of 1,72,321 people, aged 50 years (average), from the United States were enrolled for the present study. All of them had been a part of the National Health Interview Survey conducted by the Centers for Disease Control and Prevention (CDC) and the National Center for Health Statistics between 2013 and 2018. Half (54%) of the participants were women. Through this study, the researchers aimed to examine the impact of sleep behavior on life expectancy. The National Death Index records were used to ascertain the association between sleep and mortality, both all-cause and cause-specific.

Five parameters were used to determine the pattern score: Sleep duration of 7 to 8 hours (ideal), difficulty falling asleep no more than 2 times in a week, trouble staying asleep no more than 2 times a week, not using any sleep medication and feeling rested after waking up at least 5 days a week. Each variable was given a score of 0 or 1 with a maximum score of 5 indicating the highest quality sleep.

Over 4.3 years (median) of follow-up, 8,681 deaths were recorded; CVDs accounted for 2,610 deaths (30%), while 2,052 (24%) were from cancer and the remaining (46%) were due to other causes. The all-cause mortality was reduced by 30% among those who had all five favorable sleep factors with a hazard ratio (HR) of 0.7 when compared to participants who either had none or had one favorable sleep factor. Death due to CVD decreased by 21% (HR 0.79), while deaths due to cancer declined by 19% (HR 0.81). They also had 40% less probability of dying due to other causes such as infections, accidents or neurodegenerative diseases like dementia and Parkinson's disease (HR 0.6).

When the role of gender was examined among the participants who had a score of 5, men had 4.7 years longer life expectancy at age 30 years versus those who had none or only one favorable sleep measure, whereas in women with all five favorable sleep factors, the life expectancy was greater by only 2.4 years. This variation, despite similar quality of sleep, needs further study, note the authors.

Maintaining good sleep hygiene is important for health and well-being. By demonstrating an association between sleep pattern and life expectancy, this study highlights that while it is important to get adequate hours of sleep daily, a good sleep quality holds equal significance. There are four components of sleep quality: sleep efficiency (the percentage of time actually spent asleep while in bed), sleep duration, sleep latency (time it takes a person to fall asleep) and wake after sleep onset (difficulty in staying asleep).

Good sleep quality heals and is restful, i.e., you feel rested after getting up in the morning. But if you wake up

feeling tired or feel sleepy during the day, this denotes poor quality sleep. Hence, patients should be enquired about their sleep habits as a routine "as part of their overall health assessment and disease management planning".

Here are few tips to improve sleep hygiene:

- Get up at the same time every day.
- Go to bed when you are ready to sleep.
- Avoid drinking tea/coffee or caffeinated drinks nearer to your bedtime.
- Remove cell phones, computers, TV, tablets, etc. from the bedroom.
- If you are anxious and unable to sleep, try meditation, deep breathing or progressive muscle relaxation to calm the mind and relax the muscles.

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ART and Surrogacy Bill are Designed to Provide Better Medical Care Says Mandaviya

Recently, Mr Mansukh Mandaviya, the Union Minister of Health, stated that the goal of the Assisted Reproductive Technology (ART) and Surrogacy Bill is to improve patient security and medical care. He added that the incorporation of new methods and tools into ART has greatly benefited patients and raised knowledge of the causes and solutions to infertility. According to the Union Minister, the government's health program for promoting quality motherhood has paid off and decreased the Maternal Mortality Rate (MMR). With the ongoing, unwavering efforts to adopt breakthroughs in ART, he reaffirmed his belief that India will make significant progress toward providing couples in India with the best facilities and care for fertility.

In addition, Mr Mandaviya identified poor menstrual hygiene as a significant beginning cause of childlessness in relationships. He also praised ISAR's efforts in providing a platform for thousands of *in vitro* fertilization, ART, gynecologists, embryologists and ART technologists to get together, exchange knowledge and discuss technical advancements and ideas that would ultimately benefit patients. (*Source: https://health.economictimes.indiatimes.com/news/policy/art-surrogacy-bill-strive-to-provide-better-medical-care-mandaviya/97617766*)

Experts Concerned Over New Diabetes Drugs not Dealing with Root Causes of Obesity

Recent statistics show that between 1993 and 2019, the percentage of obese adults in England increased from 14.9% to 28%. Data from NHS England show that in 2019-20, 10,780 hospital admissions were directly related to obesity. Many people find it challenging to maintain their weight loss through diet and exercise, so interest in medications that work by stimulating the hormones that make people feel full after eating is growing. In one study, individuals dropped up to 20% of their body weight throughout a 72-week trial while taking tirzepatide and making lifestyle adjustments. However, doctors believe that while the dramatic effects of such treatments are welcome, there are worries they can make people less motivated to take steps to prevent obesity in the first place. Experts stated that there has been an increase in the prescription of blood pressure (BP) medications and statins due to the increased number of people who have high BP from overeating salt and high low-density lipoprotein (LDL) cholesterol from overeating saturated fat. There are obstacles to their use, although the UK's National Institute for Health and Care Excellence (NICE) has already approved the use of two diabetes medications, liraglutide and the more potent semaglutide for certain groups of obese people. The medications have downsides, including the fact that they are pricey and can only be taken by injection. Experts say further research is needed on safety and adverse effects. According to a body image and mental health advocate, introducing the medications won't lessen the pressure of the already obese people.

Doctors' suggested that it is better to avoid unhealthy foods rather than trying to reverse the effects of obesity. Hence warned and said that aim should also focus on helping people lose weight and prevent developing obesity. (*Source: https://www.theguardian.com/society/2023/feb/05/new-diabetes-drugs-do-not-tackle-root-causes-of-obesity-experts-warn*)

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World Kidney Day 2023: Kidney Health for All – Preparing for the Unexpected, Supporting the Vulnerable: Are We Well Prepared?

The menace of kidney diseases including chronic kidney disease (CKD) has taken more than 850 million people worldwide[1] in its grip. In India, the prevalence of CKD cannot be accessed accurately but it has been reported to be 17.2% by Screening and Early Evaluation of Kidney Disease study.[2] The recent pandemic has proved that CKD patients are more vulnerable to the deadly coronavirus disease 2019 (COVID-19).[3] The third world and other developing countries are even more vulnerable[4] because of risk factors like poverty, poor sanitation, pollutants, water contamination, overcrowding and increasing incidence of hypertension and diabetes. The burden of diabetes is high and increasing globally, particularly in developing economies like India. The estimates in 2019 showed that 77 million individuals had diabetes in India, which is expected to rise to over 134 million by 2045.[5]

World Kidney Day is an annual global campaign that aims to raise awareness about the importance of kidney health and the role of kidneys in our overall health.[6] The theme for World Kidney Day 2023 (9th March, 2023) is "Preparing for the unexpected, support the vulnerable!", which emphasizes the need to support people who are at risk of kidney disease and those who have already been diagnosed. In India, the campaign is more critical than ever, given the high burden of kidney disease in the country.[2] It is expected that most people in India are not aware that they have kidney disease, and the disease often goes undiagnosed until it has reached an advanced stage. In this article, we share our views on different policy changes which are needed to fulfil the theme of World Kidney Day 2023.

HOW TO BE PREPARED FOR THE NEXT PANDEMIC?

The COVID-19 pandemic has highlighted the importance of preparedness and proactive measures in managing a global public health crisis. While the world is still grappling with the current pandemic, it is essential to learn from this experience and prepare for future pandemics. Figure 1 depicts various strategies needed to be prepared for next unexpected health disaster.

- **Strengthen health care systems**: A strong health care system is crucial in managing a pandemic. Governments should invest in health care infrastructure, such as hospitals, clinics and medical supplies, to ensure adequate capacity to respond to a pandemic. This includes increasing the number of health care workers and ensuring that they have the necessary training and resources to manage the crisis effectively.
- **Develop and maintain pandemic preparedness plans**: Governments, health care organizations and businesses should have a plan in place for managing a pandemic. This plan should include strategies for testing, contact tracing and quarantine, as well as procedures for obtaining and distributing medical supplies and equipment. The plan should be regularly updated and tested to ensure its effectiveness.
- **Invest in research and development**: One of the critical aspects of managing a pandemic is the availability of effective treatments and vaccines. Governments and private organizations should

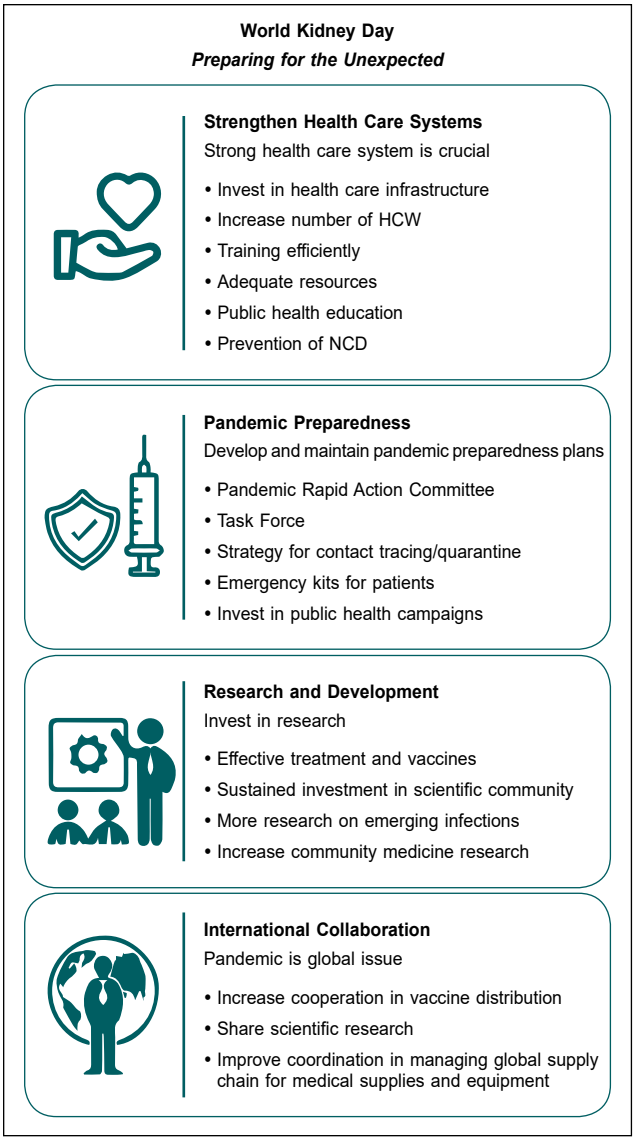

Figure 1. Preparing for the unexpected: we need to be well prepared for the next unexpected health disaster.

invest in research and development of new treatments and vaccines that can be quickly deployed in the event of a pandemic. This will require sustained investment in the scientific community to ensure that researchers have the necessary resources to develop effective treatments and vaccines.

- **Promote public health education**: Public health education and awareness are essential in managing a pandemic. Governments and health care organizations should invest in public health education campaigns to educate people about the risks and symptoms of a pandemic, as well as measures they can take to protect themselves and others. This includes basic hygiene practices, such as hand washing, social distancing and wearing masks.

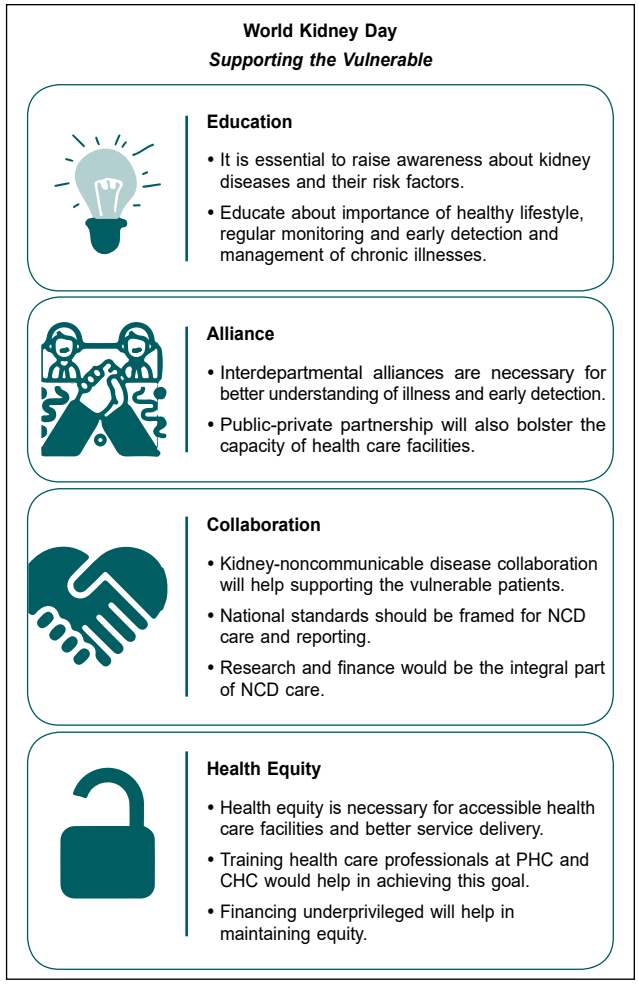

Figure 2. "EACH" concept for supporting the vulnerable.

- **Increase international cooperation**: Pandemics are a global issue, and international cooperation is essential in managing them effectively. Governments, international organizations and the private sector should work together to share information, resources and expertise. This includes increasing cooperation in vaccine distribution, sharing scientific research and improving coordination in managing the global supply chain for medical supplies and equipment.

HOW CAN WE SUPPORT THE VULNERABLE?

We propose **"EACH" concept** for supporting the vulnerable in India (Fig. 2). "EACH" stands for- **E**ducation, **A**lliance, **C**ollaboration and **H**ealth Equity.

To support these vulnerable groups, it is essential to raise awareness about kidney disease and its risk factors. This can include educating the public about the importance of a healthy lifestyle, regular kidney function testing, and early detection and management of chronic illnesses.

Interdepartmental alliances are necessary for better understanding of illness and early detection of kidney disease. Public-private partnership (PPP) will also bolster the capacity of health care facilities and help in the early diagnosis and prompt treatment of such illnesses. Kidney-noncommunicable disease (NCD) collaboration will help support the vulnerable patients. National standards should be framed for NCD care and reporting. Also, research and finance would be the integral part of NCD care.

Health equity is necessary for accessible health care facilities and better service delivery. Training health care professionals at primary health care centers and community health care centers would help in achieving this goal. Financing the underprivileged will help in maintaining equity and should be promoted by PPP models.

In addition, there is a need to increase access to health care, particularly in rural areas where the burden of kidney disease is higher. This can include the expansion of telemedicine services and the training of health care professionals to provide specialized care for kidney disease.

In conclusion, we should be well prepared for the next pandemic and strengthen our health care system, develop and maintain pandemic preparedness plans, invest in research and focus on international collaboration. To support the vulnerable, the "EACH" concept is worth implementing.

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Campaign to Stop the Transmission of Measles Launched by Haryana Government

Mr Anil Vij, State Health Minister (Haryana), revealed that the state government is conducting a measles-rubella (MR) catch-up campaign in the Nuh and Palwal districts to curb the spread of the disease. He added that the MR catch-up campaign began on 6th February in the blocks of Hathin and Hodal in Nuh and Palwal.

He added that all eligible children between the ages of 9 months and 15 years will receive an extra dose of the MR vaccination as part of the program. Also, a total of 4,722,250 youngsters will receive an additional dose of MR as a part of the campaign.

According to Mr Vij, during the first week of the campaign, beneficiaries will be covered in schools, and then outreach events will be held to provide extra doses of MR. He stated that the Deputy Commissioners in both districts had launched the campaign, which is being watched over by state nodal offices and officers from partner organizations like WHO and UNICEF to guarantee 100% coverage.

Moreover, he announced that the goal of eliminating measles and rubella has been communicated to all line departments, including those responsible for women's and children's development, Panchayati Raj, Education, IMA and IAP. (*Source: https://www.news18.com/news/india/haryana-govt-launches-campaign-to-stop-transmission-of-measles-7014553.html*)

ORIGINAL ARTICLE

Prevalence of Health Problems, Professional and Financial Satisfaction among Doctors Working Across Vadodara City: A Cross-sectional Study

SANGITA V PATEL*, SANJAY NATU†, SHLOK SHAH‡, JESAL H PATEL#, MITAL BAMBHAVA¥, SAUMITRA£, GREENAM TARANI^

ABSTRACT

Background: The present study was conducted to know the distribution of various health problems among doctors and to assess professional and financial satisfaction levels among doctors. **Methods:** A Google Form questionnaire-based cross-sectional study was conducted among 122 doctors in Vadodara selected purposively after taking consent. Google form was circulated by email and WhatsApp groups. The form consisted of questions related to demographic details, health problems, financial and job satisfaction. All the responses were recorded and analyzed in MS Excel 2019. **Results:** Among the 122 doctors, 89 (72.95%) were male and 33 (27.04%) were female and 101 (82.78%) doctors were taking treatment for some ailment. Around 86.9% of doctors regularly opt for a health check-up. Among the health problems reported by doctors, the most common were musculoskeletal ailments (72.13%) followed by hypertension (28.9%), diabetes (17.2), cardiac (12.3%), endocrinal (10.65%), eye (9.01), mental (6.55) problems. Approximately 37.70% of doctors answered that health problems temporarily affect their work; 5.73% of doctors felt the need to modify their work pattern. About 91.80% of doctors were satisfied by their profession, while 108 (88.52%) doctors were financially satisfied with their work. **Conclusion:** More than half of the professionals complained of musculoskeletal problems. The majority of health care professionals were professionally and financially satisfied.

Keywords: Health problem, doctors, professional satisfaction, financial satisfaction

Health care workers (HCWs) include doctors, nurses, health assistants and technicians who deliver care and health care services directly or indirectly to the sick patients. There have been many studies on the care and conditions of the patients receiving health care services, but very little study has been done on the health conditions of the HCW in India. Latest records of the Indian Medical Council puts the total number of doctors in India at 1.2 million.[1] HCWs are known to lose sight of their own health in the services of the patients. They have higher rates of mental, psychological, physical health disorders as compared to the general population.[2]

Health status of doctors is an important determinant of the type of services they deliver to their patients. The health status, level of mental fatigue, burden of physical disease can determine the level of care imparted and the holistic preventative strategies suggested by the doctor to their patients. Level of job satisfaction also plays an important role in the level of health care being delivered by the doctors. Studies have shown that patients report much higher quality of services from doctors who are satisfied with their jobs.[3] Healthy doctors are more likely to provide healthy preventative health strategies to their patients; they act as role models and motivate the patients into incorporating these preventive measures in their lives.[4]

The objective of this study was to find out the prevalence of various health problems among doctors.

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METHODS

A cross-sectional study was conducted among doctors in Vadodara city based on a Google Form questionnaire-based method. A Google Form was created and circulated by email and WhatsApp groups amongst the doctors, which included government and private MBBS practitioners and specialists. The form consisted of questions related to demographic details, health problems, financial and job satisfaction. Data form was prepared. Initially, it was sent by email and WhatsApp. Printed forms were delivered to doctors, who were not comfortable in filling up the form electronically, and collected from them. The study was conducted from 2018 to 2019. The study was approved from Institutional Ethical Committee. The participation in the study was voluntary and after taking consent. All data fields were optional. Two hundred fifty doctors were contacted on WhatsApp and email. Repeated reminders were sent. Email responses were received from 75 doctors; 47 responses were obtained via physical forms. Purposive sampling technique was used. Total 122 responses were analyzed. All the responses were recorded and analyzed in MS Excel 2019. The percentage was calculated.

RESULTS

A total of 122 doctors were studied, of which 89 (72.95%) were male and 33 (27.04%) were female. Majority of doctors belonged to the age group of 55 to 60 years (36.88%) followed by 60 to 65 years (22.13%). There were 84.43% specialists (MD/MS) and remaining were MBBS (15.57%). There were 26 (21.31%) government practitioners, while 96 (78.68%) had private jobs. Seventeen (13.93%) doctors had no health problems, while 105 (86.06%) suffered from health problems. A total of 101 (82.78%) doctors were receiving treatment of any ailment (Table 1).

Of the total doctors in this study, 86.9% opted for a health check-up regularly. The most common health issues were related to musculoskeletal problems (72.13%). This was followed by hypertension (28.9%), diabetes (17.2%), cardiac (12.3%), endocrine disorders (10.65%), eye (9.01), mental problems (6.55), respiratory problems (6.5%), gynecological conditions (5.73), hearing loss (4.91%), allergic (4.91%), surgical (3.27%), gastrointestinal (2.45%), genitourinary (2.45%), malignancy (0.81%) and autoimmune disorders (0.81%) as shown in Figure 1. About 37.7% informed that health

Table 1. Doctors who are on Treatment for their Health Problems (n = 122)

	No.	Percentage (%)
Yes	101	82.78
No	21	17.21

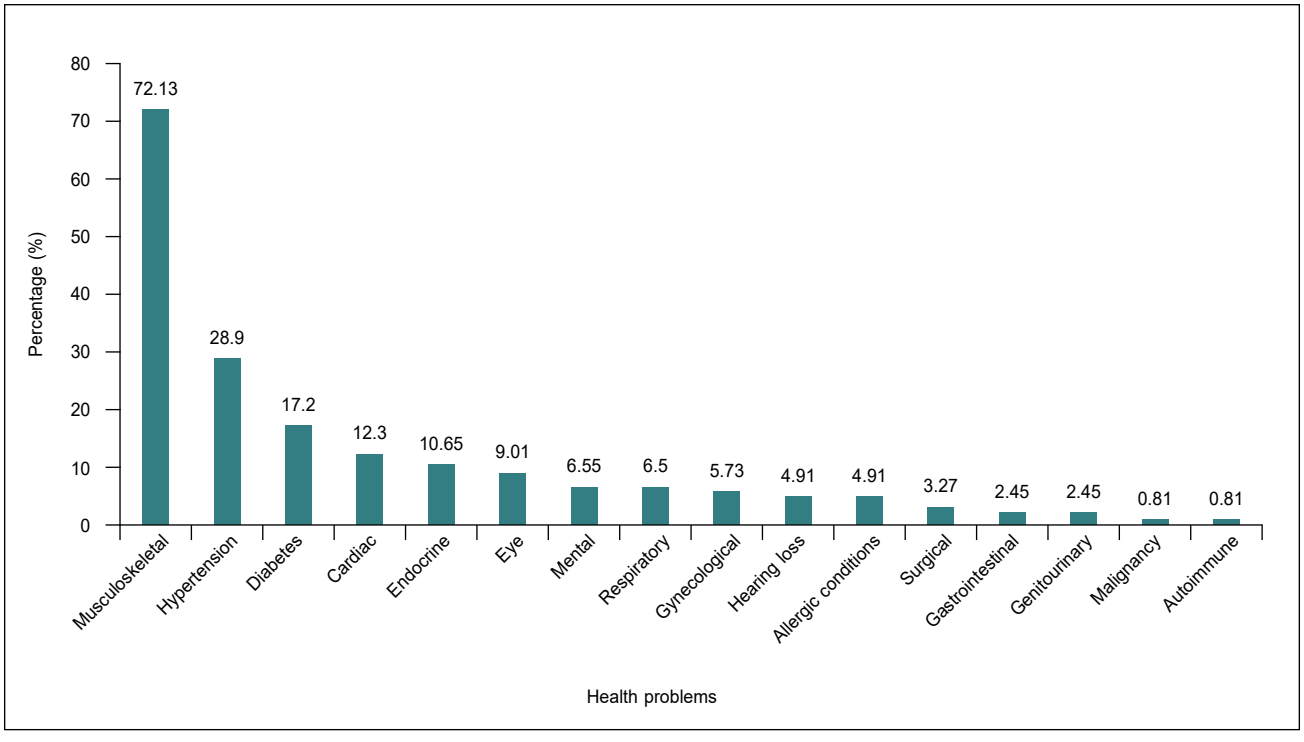

Figure 1. Distribution of health problems in percentage (%) among doctors.

Table 2. Effects of Health Problems on their Professional Performance

Variable	No.	Percentage (%)
Not at all	46	37.70
Need to modify work pattern	7	5.73
Temporarily affect work	46	37.70
No response	23	18.85

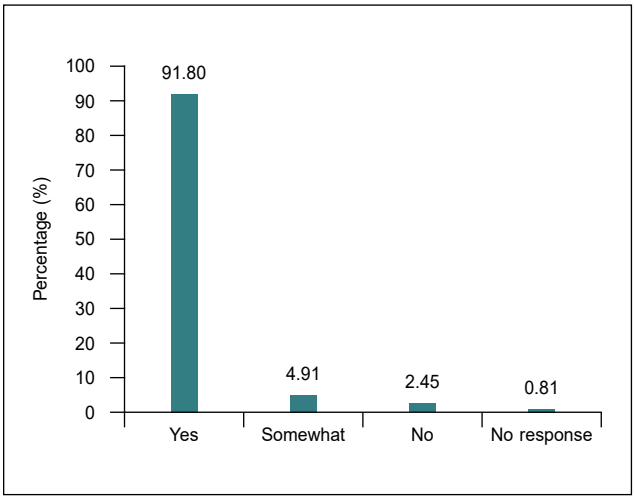

Figure 2. Professional satisfaction among doctors.

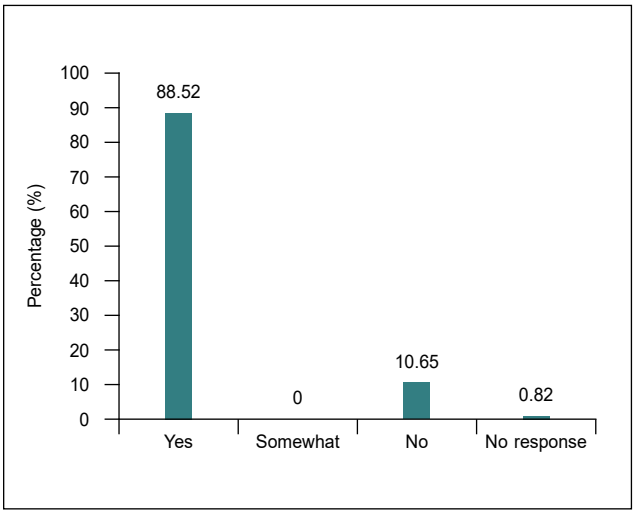

Figure 3. Financial satisfaction among doctors (n = 122).

problems affected their professional performance as shown in Table 2; 5.73% of doctors felt that they needed to alter their work patterns and routine.

This study also reported that 91.80% of doctors were satisfied by their profession as shown in Figure 2. Of the total doctors, 108 (88.52%) doctors were financially satisfied with their work (Fig. 3).

DISCUSSION

With increasing pressures of handling large patient populations to maintaining high standards in the competitive health care industry, doctors have been unaware of their own health care status as shown by our study. Of the total doctors studied, 82.78% of the doctors were receiving some kind of medical treatment for any ailment. This highlights the deteriorating status of health care of doctors.

In this study, data has been collected regarding all-cause treatment and ailment consideration in the physicians and that have been approached directly. We found that physicians have a high level of musculoskeletal disorders and are taking treatment for the same. In addition, there was lower occurrence of other health disorders involving cardiac disorders, respiratory disorders, etc. This shows that despite less attention to their personal health, doctors manage to follow good preventative strategies. The increased incidence of musculoskeletal disorders can be due to over exertion due to continuously being overloaded and working for longer periods of times, and working multiple shifts. A study showed that physicians who work multiple shifts consecutively are more prone to fatigue and exertion as compared to those who work fewer consecutive shifts.[5] The findings in this study that the occurrence of chronic health conditions is low among physicians were consistent with several studies which investigated differences in health status between physicians. A Norwegian health study amongst physicians reported that general status of self-perceived health is usually better amongst physicians than compared to general population.[6]

Physicians experienced significantly hospitalizations due to chronic diseases and many other specific causes like metabolic diseases, circulatory system diseases, genitourinary system diseases, etc. compared to general populations.[7] A study conducted amongst the HCWs in the United States of America found that the prevalence of clinical chronic venous insufficiency and venous reflux was found to be high among HCWs despite a low frequency of cardiovascular comorbidities.[8]

The occurrence of mental and psychological disorders amongst the doctors of our study is significantly low. HCWs are more likely to experience mental health problems because of intensely stressful and emotional situations in treating the sick, being exposed to human suffering and death, facing unique pressures from relationships with the patient, family members and employers.[9] In particular, HCWs experience high rates of burnout, stress and depression due to excessive workload, workplace violence and bullying.[10]

The low incidence of cardiovascular, respiratory, genitourinary problems and disorders in our study is also consistent with many other studies.[11] These findings of our study could be correlated to the fact that physicians have better knowledge and volition to practice preventative strategies, dietary factors and healthy lifestyle changes.[12] Several studies have shown that healthy lifestyle changes are related to decreased incidence of lifestyle disease such as diabetes, hypertension, obesity, etc. Hence, the following of healthy lifestyle trends could be the reason for lower incidence of chronic lifestyle diseases and all-cause mortality.[13] Studies have also shown decreased incidence of lifestyle diseases amongst those who have an active lifestyle and indulge in outdoor recreational activities like outdoor sports. Cycling as a mode of commuting is quite prevalent among HCWs in India, and this could be the potential reason for decreased incidence of lifestyle diseases. However, a study conducted in 2016 found positive association of active commuting with hypertension and central obesity which shows conflicting evidence on the relationship between active commuting and cardiovascular risk factors.[14]

Moreover, studies have shown that physical exercise in the form of exercise and outdoor activities can lead to decreased incidence of diabetes mellitus, hypertension, obesity and other cardiovascular diseases. This is evidently shown by our study where, 42% of nonsurgical and 34% of surgical field. HCW were involved in exercise and 40% nonsurgical field and 37% surgical field. HCWs were involved with some type of outdoor activities. It also showed that 31% of the total doctors engaged in any other outdoor non-specific activities reduces stress and increases physical exertion. This is consistent with other studies which have shown that outdoor activities, physical activities, exercise and recreational activities reduce stress and decrease the incidence of health disorders.

The prevalence of diabetes in India is estimated to be 7.3% with greater prevalence among the lower socioeconomic strata.[15]

Presenteeism is a phenomenon in which despite complaints and ill health that should prompt them to rest and take sick leave, people go to work. Currently, the highest sickness presence is largely found in the health care and educational sectors. A study conducted in Slovenia found that sickness presence was associated with psychosocial risk factors at work and their economic consequences in health care.[16]

In India, workplace violence is a major occupational issue concerning doctors. The common reasons for violence against doctors are dissatisfaction and low impulse control of patients and their family members, poor administration, miscommunication, infrastructural issues, especially differences in services between private and public hospitals. The negative media portrayal of doctors also plays an important role. This has a significant impact on the physical and psychological well-being of the health care professionals.[17]

CONCLUSIONS

Prevalence of musculoskeletal disorders and related morbidity is very high amongst health care professionals. Job factors such as long working hours, decreased daily exercise and psychological stress are factors influencing the health of the HCWs. Job satisfaction levels were very high amongst the doctors in the study. Overall, the study population showed good awareness regarding routine health check-ups.

RECOMMENDATIONS

Increased awareness about musculoskeletal diseases and preventative strategies for the same should be instituted in doctors.

Acknowledgment

We acknowledge guidance, help and efforts of our teacher and mentor Dr Ashok Vaishnavi, our colleagues Dr Jatin Jhala, Dr Rajiv Gokhale, Dr Vihang Mazumdar, Dr Nand Chawala, Dr Sheela Chawala, Dr Satish Shah and Dr Arun Phatak and Dr Anagha Natu in designing and finalizing this study. We thank all doctors who participated in the study for their support in carrying out this study.

Source(s) of Support: Nil.

Conflicting Interest: Nil.

The manuscript has been read and approved by all the authors.

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■■■■

Pregnancy Complications are Associated with an Increased Risk of Heart Disease

According to a study published in the journal *JAMA*, narrowing and calcification of the blood vessels of the heart are more common in women previously affected by pregnancy complications.

Although pregnancy complications are now more widely recognized as a new type of risk factor for heart disease, it is still unclear how this information may be most effectively applied in the health care industry. For the study, researchers enrolled 10,528 women from the National Medical Birth Register who later took part in the SCAPIS (Swedish CArdioPulmonary bioImage Study).

To identify blood vessel calcification, narrowing and other symptoms of heart disease, all the women underwent coronary CT angiography. Pre-eclampsia, high BP during pregnancy (gestational hypertension), preterm delivery, gestational diabetes and infants born small for gestational age were five typical problems of pregnancy that the researchers looked into for signs of heart disease.

In women whose pregnancies had not been complicated, the prevalence of coronary artery constriction was 2%, as opposed to 5% in women who had previously experienced pre-eclampsia or pregnancy-induced hypertension. (*Source: https://medicalxpress.com/news/2023-02-complications-pregnancy-linked-heart-disease.html*)

REVIEW ARTICLE

Vitamin D in Clinical Practice: Current Perspectives

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ABSTRACT

India is a heliophobic country; despite ample sunshine, almost 490 million people are vitamin D deficient in the country. Additionally, the Indian diet has not been successful in providing the daily need for vitamin D, leading to a vitamin D deficiency. The need to fortifying food with vitamin D has been raised several times. Besides, there have been discussions about whether vitamin D is a hormone or a vitamin? In this review, the authors have reviewed vitamin D deficiency and its status in India, assessment and screening, the role of vitamin D in various disease conditions, dosage recommendation and regimen.

Keywords: Vitamin D, heliophobic, vitamin D deficiency, hypervitaminosis

With approximately 490 million people deficient in vitamin D in a sun-rich country like India, it is important to emphasize the significance of vitamin D sufficiency. Besides, the Indian diet generally fails to provide the daily need for vitamin D, resulting in a deficiency. There is a need to fortify various foods with vitamin D through national health programs and raise awareness about the importance of diet, lifestyle and vitamin D supplementation. Another ongoing discussion is whether vitamin D is a vitamin, prohormone or hormone precursor. Hence, this silent epidemic needs to be addressed appropriately. In this article, the authors have reviewed the present status of vitamin D deficiency in India, its positioning as a vitamin or hormone, clinical implications in various conditions, and given recommendations on the use, dosage and duration of vitamin D use. An algorithm has also been suggested for managing the population's vitamin D deficiency and sufficient conditions.

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EPIDEMIOLOGY OF VITAMIN D DEFICIENCY

Vitamin D deficiency has been cited for having assumed pandemic proportions, despite being the most under-diagnosed and under-treated nutritional deficiency globally.[1] In the general population across the world, vitamin D deficiency ranges from 20% to 80% and in critically ill patients, the prevalence increases with a simultaneous rise in disease severity.[2] With an exponential rise in prevalence, recent observational studies have revealed that almost 40% of Europeans are vitamin D deficient, while 13% are severely deficient.[3] Vitamin D deficiency or insufficiency has been reported from several countries across the globe, including the United States, South America, Canada, the Middle East, Australia, South Asia, Europe and Africa. Studies from India have reported a wide range of vitamin D deficiency, from 30% to as high as 100%. Other parts of the world, like the Middle East, China and South America, have also reported an alarmingly high prevalence of vitamin D deficiency.[4]

Several countries worldwide report a very high prevalence of low vitamin D status. Vitamin D [25(OH)D] levels below 30 nmol/L occur commonly in India, Tunisia, Pakistan and Afghanistan in over 20% of

the population. Studies have shown that 490 million individuals have vitamin D deficiency in India.[3]

Another study amongst South Asian adults revealed a high (68%) and variable prevalence of vitamin D deficiency among the adults of different South Asian countries, which was hypothesized to be linked to the high prevalence of several other health issues in this region. A country-wise comparison revealed that Sri Lanka had the lowest prevalence of vitamin D deficiency (48%), while Pakistan had the highest prevalence (73%). Bangladesh and the Indian population had about 67% prevalence of vitamin D deficiency.[5]

Community-based studies conducted in the last 10 years have shown a prevalence range of 50% to 94% of vitamin D deficiency in India. A high prevalence of vitamin D has been noted in the country.[6] A study conducted in South India showed a high prevalence of vitamin D deficiency among pregnant women, attributed to reduced physical activity, sun exposure, darker skin complexion, lower socioeconomic status and lack of awareness.[7] A single-center cross-sectional study in North India revealed a prevalence of vitamin D deficiency of 55.55% and inadequacy of 38.46%.[8]

While sun exposure can suffice for vitamin D sufficiency, it is a frequently witnessed nutritional deficiency. Even though India is a tropical country with abundant sunshine, it seems to be a heliophobic country as vitamin D deficiency has been prevalent. Vitamin D deficiency is commonly present in individuals of all ages, gender, race and geography.[1]

As per a report by the International Osteoporosis Foundation in 2009, 96% of neonates, 91% of healthy school girls, 78% of healthy hospital staff and 84% of pregnant women in North India were diagnosed with hypovitaminosis D.[9]

A cross-sectional multicenter study has demonstrated a high prevalence of vitamin D deficiency across India in healthy, middle-aged health care professionals.[10] Vitamin D deficiency is particularly pronounced in special categories of patients, including patients with chronic renal failure and on hemodialysis, renal transplant recipients affected with liver disease or after liver transplantation, ranging from 85% to 99%.[3]

Besides, critically ill patients have an extremely high prevalence of vitamin D deficiency, and low vitamin D levels are also associated with increased illness severity, morbidity and mortality in patients admitted to intensive care units (ICUs) and medical and surgical ICUs.[3] In a study conducted in South India, vitamin D deficiency was present in all patients with active tuberculosis despite adequate sunlight exposure in 72% of the cases.[11]

The Eradication of Vitamin D Deficiency

Vitamin D deficiency is a global issue manifesting several clinical signs and symptoms with major consequences. Vitamin D deficiency has a high global prevalence and leads to many health risks, including bone health, chronic pain in cancer, musculoskeletal, fibromyalgia, autoimmune conditions, cardiovascular diseases (CVDs) and even neurological system disorders. The benefits of vitamin D are undisputable in bone health. An early application of vitamin D is further supported by extraskeletal benefits.[12] Considering the high prevalence of vitamin D and its overarching consequences, it is important to take steps toward eliminating vitamin D deficiency.

Iodine deficiency, at one point, was the world's single most important preventable cause of brain damage and mental retardation. Thirty-eight million newborns in developing countries remain unprotected from the lifelong impact of brain damage associated with iodine deficiency disorders. A massive worldwide effort led to a dramatic rise in the proportion of people consuming iodized salt, from under 20% in the 1990s to about 70% by 2000.[13] The Iodine Deficiency Disorder Control Programme in India is a public health success story. The successful translation of research to policy to program, sustained political commitment, the increased production of iodized salt and involvement of the private sector, the institution of legislation to ensure iodization of salt and the catalytic role played by academic institutes, civil society and international agencies are key factors in establishing the success of Iodine Deficiency Disorder Control Programme.[14] Taking cues from the successful programs implemented to eradicate iodine deficiency, measures such as nutritional replenishment of iodine, robust health and nutrition education activities to create demand for iodine insufficiency and developing monitoring information systems for ensuring that iodine is sufficiently available to the population,[14,15] we can facilitate evidence to policy transition to eradicate vitamin D from India.

IS VITAMIN D A VITAMIN OR HORMONE?

There has been a discussion amongst clinicians and researchers about whether vitamin D is a prohormone or hormone precursor, as it has to be synthesized by the sunlight for activation. Unlike other vitamins such as A, B and C, vitamin D is the only vitamin that the body can

make. It plays an important part in the neurobiological pathways and cascading effects associated with mental health. Other evidence has also shown that it has a crucial role in various endocrine pathways, reiterating that vitamin D deficiency is a hormonal deficiency. Besides, vitamin D is also involved in brain development on a hormone level. Hence, vitamin D fits more appropriately in the criteria of a hormone replacement rather than a vitamin supplement.[12]

Technically, the term vitamin D is misleading, as it cannot be considered a true vitamin. The body has the capacity to synthesize its own cholecalciferol (D3). Hence, it is more accurately referred to as a steroid hormone or an oxysterol. The International Union of Pure and Applied Chemistry's Commission on the Nomenclature of Biological Chemistry defines vitamin D3 as a 'steroid or secosteroid'[16] (Refer Box).

Box. Vitamin D: Vitamin vs. Hormone

Evidence suggesting that vitamin D is a hormone	
Prohormone	Vitamin D is a prohormone, the body converts the substance Vitamin D into a hormone for it to be used.[12] It is a key regulator of bone metabolism and calcium and phosphorus homeostasis through negative feedback with the parathyroid hormone.[17]
Hormone precursor	Vitamin D is a hormone precursor, as it must be synthesized by the sunlight for activation.[16]
Synthesized by the body	The only vitamin that can be made by the body, unlike other vitamins.[18] The endogenous synthesis occurs by ultraviolet light exposure of 7-dehydrocholesterol within the microvessels of the skin resulting in its conversion into cholecalciferol.[18]

Vitamin D Formulations

Vitamin D preparations may be administered orally, subcutaneously, intraperitoneally or intravenously. They may be administered daily, sometimes in divided doses or intermittently in large bolus doses, usually 3 times per week. The timing of the dose is also important which may be at night, as the gut calcium load is at a minimum at night.[19]

Vitamin D is available in two forms in India: Vitamin D2 (ergocalciferol) and vitamin D3 (cholecalciferol). A market assessment in India has shown that over 99.9% of the preparations contain vitamin D3 in the form of alfacalcidol, calcitriol or cholecalciferol. Most of the preparations have vitamin calcitriol or alfacalcidol. About 10% of preparations contain cholecalciferol.[20]

The most common formulation for oral administration is in the form of tablets and capsules. Alfacacidiol and calcitriol are commonly available as tablets and capsules; cholecalciferol is in the form of granules in sachets. Other dosage forms include syrups and soft gel capsules. More than 75% of alfacalcidol preparations also contain calcium. Most of the calcitriol preparations are combined with zinc or zinc sulfate. Several vitamin D preparations also contain various other minerals/vitamins such as magnesium, cupric, boron, methylcobalamin, vitamin E, vitamin K, vitamin C, pyridoxine, folic acid, beta-carotene, glutamic acid, manganese, omega-3 and docosapentaenoic acid.[20]

Tablets and capsules contain 10-10,000 IU of vitamin D and are usually administered on a daily basis. Cholecalciferol soft gel capsules, syrup and sachets containing granules of vitamin D (60,000 IU) are given weekly. Vitamin D2 preparation is available in tablet form in two formulations containing 20 IU and 100 IU, respectively.[20]

The parenteral route has been shown to be effective and safe in patients with hypovitaminosis D caused by severe intestinal malabsorption. Intramuscular vitamin D is the preferred treatment for malabsorption disorders like intestinal bowel disorders, pancreatic insufficiency, short-bowel syndrome, gluten enteropathy, post-bariatric surgery and any need to total parenteral nutrition.[21] Table 1 depicts the different preparations of vitamin D formulations available in India.

Recommended Vitamin D Levels in the Body

Maintaining adequate serum levels of 25(OH)D for skeletal and extraskeletal physiologic effects is important. Studies have shown that the desirable and safe levels of serum 25(OH)D levels should be 30-100 ng/mL because, at the level of 30 ng/mL, the intestinal calcium

Table 1. Different Formulations of Vitamin D

Formulation	Vitamin D strength	Administration
Tablets/Capsules	10-10,000 IU	Daily
Sublingual tablets	10-10,000 IU	Daily
Soft gel capsules/ granules/syrup/tablet	60,000 IU	Weekly
Intramuscular injection	6,00,000 IU/mL	Weekly
Soft gelatin capsules/tablets	10-10,000 IU	Daily

absorption reaches its highest level and parathyroid hormone (PTH) levels are continually reduced until this level of 25(OH)D is reached.[6]

Vitamin D deficiency is described as a serum/plasma level of 25(OH)D below 75 nmol/L (or 30 ng/mL). A threshold of <25 or <30 nmol/L (or 10/12 ng/mL) can raise the risk of osteomalacia and nutritional rickets, thus determining severe vitamin D deficiency.[3]

The clinical practice guidelines of the Endocrine Society Task Force on vitamin D have described a cut-off level of 50 nmol/L as vitamin D deficient.[22] In addition, various societies and expert bodies worldwide define 50 nmol/L as the vitamin D requirement of all normal, healthy individuals, primarily considering bone health.

We recommend that desired serum level of vitamin D should be between 40 and 60 ng/mL, and hence, appropriate vitamin D dose should be administered.

INDICATIONS FOR VITAMIN D

Musculoskeletal Effects of Vitamin D Deficiency

Rickets and osteomalacia

Vitamin D, a secosteroid hormone, is crucial for calcium absorption and bone mineralization absorption, which positively associates with bone mineral density.[23] It is known that prolonged and severe vitamin D deficiency causes rickets in children and osteomalacia in adults. Results from several clinical studies have shown that vitamin D supplementation can improve muscle strength contributing to a reduction in the incidence of falls.[23]

It has been established that insufficient vitamin D intake over a prolonged period can result in bone demineralization. Vitamin D deficiency reduces calcium absorption, eventually reducing the calcium concentrations in the circulation. Vitamin D deficiency also causes secondary hyperparathyroidism, which structurally weakens the bone and increases the risk of fractures.[23]

Maternal vitamin D deficiency passes on to the infant who is at high risk of presenting in the first few days or months of life with hypocalcemic complications, including seizures, tetany and dilated cardiomyopathy. Vitamin D deficiency in older children can result in motor delay, proximal myopathy and dental complications. Osteomalacia in girls can result in pelvic deformities and lead to obstructed labor later in life.[24]

Vitamin D deficiency triggers the release of PTH, which enhances urinary phosphate excretion, resulting in hypophosphatemia and osteomalacia.[25] Low calcium intake and/or low vitamin are the primary reason for body calcium deprivation across the world, and their combined deficiency accelerated bone demineralization.[24]

Osteoporosis

Osteoporosis is defined as a bone mineral density (BMD) 2.5 standard deviations below the mean of healthy young individuals. Also, there is a direct relationship between BMD and fracture risk. Hence, vitamin D plays a key role in osteoporosis and fractures.[23]

The results of vitamin D deficiency are secondary hyperparathyroidism and bone loss, resulting in osteoporosis and fractures, mineralization defects, which may lead to osteomalacia in the long-term, and muscle weakness, causing falls and fractures. Several randomized controlled trials have shown that vitamin D and calcium showed a significant reduction in the incidence of fracture.[26]

Research has shown that vitamin D supplementation improves BMD and enhances muscle function, leading to reduced falls. It can also modulate the effect of pro-inflammatory cytokines on bone metabolism.[23]

Vitamin D sufficiency is, therefore, pivotal for normal skeletal development both *in utero* and in childhood and sustaining bone health in the adult population. A deficiency of vitamin D in mothers can lead to a considerable reduction in infant bone mineral acquisition, which is persistent in nature.[27]

Sarcopenia

Sarcopenia refers to a loss of skeletal muscle mass with aging. It is marked by the progressive and generalized loss of skeletal muscle mass and strength with a risk of adverse outcomes such as physical disability, poor quality of life and death. Studies have shown a positive correlation between serum 25(OH)D concentration and muscle function. A decline in serum 25(OH)D concentration with rising age leads to reduced bone density, leading to a higher risk of falling and bone fractures.[28]

Studies have shown that older people with vitamin D deficiency may be at risk of sarcopenia, a geriatric syndrome featured by the progressive loss of skeletal muscle mass and strength frequently complicated by adverse events, including falls, disability, hospitalization and death.[29]

MOAN syndrome

MOAN refers to the musculo-osteo-arthro-neuropathic syndrome. Osteoporosis is often related to sarcopenia and osteoarthritis and is attributed to calcium and

vitamin D deficiency, which may eventually result in metabolic neuropathy and myopathy. While conditions such as sarcopenia or loss of muscle mass or strength or function may occur as a primary condition, which may result in secondary such as osteoporosis and arthritis. Even though the associations have been shown to occur individually, it is important to address MOAN syndrome as one entity. Vitamin D may play an important role in preventing and managing the MOAN syndrome.[30]

Mitogenic Disorders

Strong preclinical data have demonstrated that vitamin D is linked with cell cycle control and cancer.[31] It was shown in a Cochrane systematic review that cancer mortality was modestly reduced by vitamin D supplementation in individuals receiving a mean daily dose of 1,146 IU compared to no supplementation during a mean follow-up for more than 6 years.[32] Several large randomized controlled trials, including the VITAL trial, showed that a vitamin D supplementation group had a nonsignificant trend of reduction in total cancer mortality.

The vitamin D endocrine system influences all cells and most cytokines of the immune system.[33] As per the results of the LUNG-ViDA trial, vitamin D supplementation may have a modest impact in improving expiratory lung function.[34]

Some studies have also shown a strong link between poor vitamin D status and increased risk of infection or autoimmune diseases such as multiple sclerosis, inflammatory bowel diseases, or type 1 diabetes mellitus.[35] A causal relationship between increased risk of multiple sclerosis and genetically low serum 25(OH)D levels has also been confirmed.

Besides, pregnant women frequently report poor vitamin D status compared to nonpregnant women of the same age. Studies have shown that vitamin D supplementation may lead to a considerable reduction in maternal mortality and improve the health of the baby.[36]

Psoriasis

Vitamin D has a significant role in the treatment of psoriasis, owing to its activity in the proliferation and maturation of keratinocytes. Significant associations between low vitamin D status and psoriasis have been systematically observed. A bi-directional relationship between low vitamin D status and psoriasis is also important for delineating the risk profile for comorbidities that may result from psoriasis, including type 2 diabetes and metabolic syndrome.[37] Clinicians should consider general vitamin D supplementation in individuals who are at high risk of vitamin D deficiency, such as psoriatic patients.

Glucometabolic, Cardiometabolic and Barometabolic Disorders

Cardiovascular diseases

Vitamin D deficiency has been implicated in cardiometabolic disorders, including obesity, type 2 diabetes mellitus, CVD and polycystic ovary syndrome.[38]

Epidemiologic studies have revealed that low vitamin D levels are linked with an increased risk of cardiovascular events. 25(OH)D plays a role in diabetic CVD, myocardial infarction (MI), heart failure and peripheral vascular disease. Decreased vitamin D levels are strongly associated with a high prevalence of coronary artery disease, a 3-times rise in the rate of myocardial ischemia among individuals with hypertension. Besides, the rate of cardiovascular complications, including MI and heart failure, was higher in individuals with vitamin D deficiency who were followed for about 5 years.[39]

It was seen in a clinical trial that vitamin D treatment may be effective in patients with cardiometabolic disorders having vitamin D deficiency.[40] Another study has shown that vitamin D supplementation given at a dose of 50,000 IU for 16 weeks brought about a considerable reduction in triglyceride level.[41]

Another Iranian study demonstrated an inverse link between plasma vitamin D levels and cardiometabolic risk factors in children and adolescents.[42] Supplementation also significantly reduces blood pressure in elderly women.[43] A systematic review and meta-analysis have shown that high vitamin D levels in middle-aged and elderly populations are related to a significant reduction in CVD, type 2 diabetes and metabolic syndrome.[44]

Vitamin D deficiency is highly prevalent and may lead to arterial hypertension. Vitamin D exerts its effect by suppressing renin and PTH levels and its anti-inflammatory and vasculoprotective properties. Low vitamin D levels may be an independent risk factor for incident arterial hypertension. Results of cross-sectional studies have shown that low vitamin D is linked with higher systolic blood pressure and a higher incidence of hypertension.[39]

Real-world data has shown that high vitamin D levels are associated with a favorable serum lipid profile. While there have been mixed results from different studies, some randomized controlled studies have

indicated that vitamin D supplementation provided a statistically significant rise in low-density lipoprotein cholesterol (LDL-C), with a tendency towards a rise in total cholesterol. Besides, the effect of vitamin D supplements on serum LDL-C levels is more pronounced in obese individuals.[45] Supplementation of vitamin D (1,000 mg) for a month in healthy school children demonstrated a significant improvement in the high-density lipoprotein (HDL) level.[46]

Type 2 diabetes

Poor vitamin D levels may act as one of the driving factors for the development of type 2 diabetes. This has been corroborated by the fact that low vitamin D status is linked with an increased risk of glucose intolerance or diabetes. Longitudinal studies have exhibited that poor vitamin D level is associated with an increased incidence of type 2 diabetes. Changes in calcium and vitamin D homeostasis are related to insulin resistance, decreased β-cell function, metabolic syndrome, glucose intolerance and diabetes.[39] Vitamin D supplementation (60,000 IU) for 1 year period significantly reduced the glycemic parameters, including fasting blood glucose (FBG), postprandial blood glucose (PPBG) and glycated hemoglobin (HbA1c).[47]

Obesity and overweight

Studies have shown that fluctuation in serum 25(OH)D concentrations may be associated with a myriad of problems. It has been shown that an increase in body mass index (BMI) levels per unit is associated with a 1.15% lower concentration of 25(OH)D, with adjusted age and sex. Other evidence points towards an association between obesity, high concentration of PTH and 1,25-dihydroxyvitamin D [1,25$(OH)_2$D] with low serum 25(OH)D concentrations. Additionally, changes in behavior, low synthetic capacity, intestinal absorption and a changed metabolism play a major role in controlling vitamin D levels. Obese individuals are exposed to less sunlight, resulting in reduced synthesis of vitamin D. Besides, it has been suggested that weight loss is associated with improved serum vitamin D concentration in overweight or obese women.[39]

However, a few studies have also suggested that there are no evident benefits of vitamin D supplementation in cardiometabolic disorders.[38]

Miasma-related Disorders

Vitamin D deficiency has been shown to occur frequently in patients with chronic airway inflammatory and infectious diseases, correlated with increased disease severity. Research has shown that vitamin D modulates ongoing abnormal immune responses in chronic respiratory diseases and is shown to restrict bacterial and viral colonization into the lungs.[48]

Various studies have highlighted the association between low levels of vitamin D deficiency with increased risk of asthma and other respiratory disease symptoms, including lower lung function. Several studies involving clinical trials of vitamin D supplementation on asthma symptoms have reported positive results.[48]

Among the published clinical studies, a hospital-based cross-sectional study has reported that increased tumor necrosis factor (TNF)-α levels and low serum vitamin D concentrations are related with airway obstruction in chronic obstructive pulmonary disease (COPD) patients.[49] It has been assessed that around 40% to 90% of cystic fibrosis patients are vitamin D deficiency, with vitamin D serum levels below 30 ng/mL. Almost 15% to 20% have vitamin D levels below 15 ng/mL. While patients usually are given vitamin D supplementation when they present exocrine pancreatic insufficiency, but it normally appears at birth or during the first months of life. Hence, supplementation usually starts with the diagnosis.[50]

ASSESSMENT AND SCREENING

With the increasing awareness about the importance of vitamin D for maintaining musculoskeletal health, there has been a rise in vitamin D testing. However, uniform screening for vitamin D deficiency is not recommended in the general population as it is an expensive test. However, given that certain individuals are at high risk of vitamin D deficiency, it is important to perform targeted testing of the susceptible population.[51]

Once the treatment is initiated, timely retesting following 3 to 6 months of treatment must confirm adequate treatment and prevent potential toxic over-treatment. Vitamin D levels undergo seasonal variations and hence should be considered when tests and interpretations are conducted. In addition, risk factors for vitamin D deficiency should be considered to ensure targeted testing of patients.[52] The screening of vitamin D deficiency should be considered in the case of osteoporosis, osteomalacia, chronic kidney disease, hepatic failures, malabsorption syndromes, hyperparathyroidism, chronic treatment with medications that influence vitamin D metabolism, pregnant and lactating women, institutionalized or hospitalized patients, older adults (>65 years) in general, older adults with a history of falls or a history of nontraumatic fractures, granuloma-forming

disorders, chronic autoimmune diseases, obesity, dark skin pigmentation, different types of cancer, certain cardiovascular disorders, diabetes mellitus and its comorbidities, some neurological conditions and recurrent acute respiratory tract infections; in symptomatic patients with musculoskeletal pain; before initiating osteoporosis treatment with antiresorptive medications.[51]

Clinical Presentation of Vitamin D Deficiency

The common clinical presentations of vitamin D deficiency are listed in Table 2.[53]

Markers to Assess Vitamin D Deficiency

Total serum 25(OH)D concentration is the primary marker for assessing vitamin D status, reflecting vitamin D supply from all sources, including endogenous vitamin D synthesis in the skin, diet, supplements and mobilization from tissue stores. Patients suffering from vitamin D deficiency and other and other related health issues, such as bone diseases, require testing of additional laboratory parameters, including serum calcium, phosphate, alkaline phosphatase, PTH, creatinine and magnesium to guide further the diagnostics and treatment of these patients.[51]

Vitamin D deficiency is also accompanied by normal blood levels for calcium and phosphorus, high normal or increased levels of PTH, normal to high levels of total alkaline phosphatase, a low 24-hour urine calcium excretion rate and low levels of total 25(OH)D. Patients suffering from severe and chronic vitamin D deficiency may present with overt hypocalcemia and/or hypophosphatemia.[54] Based on risk factors and seasonal alteration in the serum levels of vitamin D, it is recommended that:

- Targeted testing based on risk factors is performed.
- Seasonal variations in vitamin D levels are considered before ordering testing for patients.
- Retesting for individuals on therapy is ordered after 3 months following the initiation of vitamin D treatment.

HYPERVITAMINOSIS D

An increased administration of vitamin D supplements may sometimes result in a higher risk of exogenous hypervitaminosis D, displaying symptoms of hypercalcemia, also referred to as vitamin D toxicity. Hypervitaminosis may develop as a result of using vitamin D analogs. Hypervitaminosis D with hypercalcemia may also be a manifestation of excessive production of $1,25(OH)_2D$ in granulomatous disorders, in lymphomas and during idiopathic infantile hypercalcemia.[55]

PREVENTION, TREATMENT AND MANAGEMENT

Sunlight

Insufficient sun exposure is the main reason for vitamin D insufficiency. The ultraviolet portion of the sunlight enters the skin and is converted to pre-vitamin D3. Pre-vitamin D3 rapidly converts within the plasma membrane to vitamin D3, which is released in the extracellular space. Factors affecting the cutaneous synthesis of vitamin D are sunscreen use, skin pigmentation, time of day, year's season, latitude and aging. Limited sensible exposure to sunlight or ultraviolet B radiation is more effective in raising blood levels of 25(OH)D than 1,000 IU vitamin D3 taken daily for most skin types.[56]

Vitamin D-fortified Foods

Vitamin D-fortified foods usually contain 100 IU per serving of vitamin D. It has been reported that consumption of vitamin D-fortified, especially milk, increased vitamin D intake and effectively increased 25(OH)D levels. Cereal, juices, other dairy products and margarine are other food items that can be fortified

Table 2. Clinical Manifestations of Vitamin D Deficiency

	Infants	Children	Adults
Symptoms	Difficult breathing, irritability	Repeated infection, bone pain, difficulty in squatting/standing/walking	Bone pain, muscle pain, muscle weakness, difficulty in squatting/standing/walking, frequent falls
Signs	Seizures, tetany stridor	Hypotonia, delayed dentition, enamel hypoplasia, dental caries, wrist widening, Rachitic rosary, knock knees, bowlegs	Waddling gait, anterior tibial weakness, rib cage tenderness, fractures, pelvic deformities, kyphoscoliosis
	Dilated cardiomyopathy, craniotabes, open anterior fontanelle and frontoparietal bossing		

with vitamin D.[1] Considering limited dietary sources of vitamin D, enhancing foods with vitamin D is a probable mode for ensuring increased consumption and improved vitamin D status.[57] Vitamin D food fortification is also an effective method to improve 25(OH)D levels, prevent vitamin D deficiency and improve the intelligence quotient in the pediatric population.[58] Besides, it has been seen that milk fortified with ergocalciferol has effectively eliminated rickets as an important health problem, and when used in high doses, ergocalciferol can effectively treat osteomalacia in adults.[59]

Pharmacological Therapy

Vitamin D supplementation

Sunlight and the skin are the primary sources of vitamin D; changes in sunlight exposure to the skin may alter vitamin D levels. There are several reasons for the low levels of vitamin D in the South Asian population, including dark skin, individuals whose skin is not exposed to sunlight because of clothing, sunscreen use or lack of outdoor activities. Besides, in winter, ultraviolet irradiation is reduced, particularly in temperate climates and air pollution leads to further vitamin D deficiency. Exclusive sunlight exposure is not adequate to achieve recommended vitamin D levels, and supplementation is necessary.[53] Vitamin D is included in the WHO Essential Medicines List 2021 and the Indian National List of Essential Medicines 2022 as micronutrient supplements.[60]

To ensure that non-specific symptoms of vitamin D insufficiency are not over-treated, patients are recommended to use over-the-counter vitamin D supplements or fortified food supplements such as cereals.[52] An empiric vitamin D supplementation without testing is suggested for patients without any risk factors or signs of deficiency but are suspected of having insufficient sun exposure or dietary intake.[54]

Vitamin D supplementation can be used to treat almost all individuals except those with an increased sensitivity to vitamin D treatment, a rare condition. Daily, weekly or monthly vitamin D supplementation at equivalent doses can adequately lead to a similar increase in 25(OH)D serum concentrations, while a daily vitamin D dosing is preferred.[51]

Individuals with an assessment of vitamin D level to be below 20 ng/mL should be treated with vitamin D supplementation. When aiming for a minimum 25(OH)D concentration of at least 30 ng/mL, a daily vitamin D supplement dose of about 1,000 IU per day is sufficient for all individuals, irrespective of the season. 100 IU of vitamin D per day increases serum 25(OH)D concentrations by about 1 ng/mL is one of the factors modulating the individual treatment response. Evaluation of treatment success should be considered in individuals with insufficient and deficient vitamin D levels after 3 months of treatment initiation.[51]

DOSAGE AND DURATION

Currently, bolus dosing with long dosing intervals is not used in the general population because of an increased risk of adverse effects such as falls and fractures related to them.[61] A 2017 metadata analysis showed that vitamin D leads to a significant benefit in case of acute respiratory infection with daily or weekly dosing but not with longer dosing intervals.[62] In the case of intensive care, an upfront loading dose, followed by a daily dose, is important to improve vitamin D levels quickly.[3]

Vitamin D dosing regimen should be such that it can maintain stable availability of several vitamin D metabolites. Vitamin D supplementation is necessary as only sunlight exposure and dietary intake are usually insufficient in most individuals. Currently, there is no international consensus on the standard level of vitamin D supplementation, and recommendations vary in different categories ranging from a daily dose of 400 to 2,000 IU.[3]

Endocrine Society has given a safe upper level for vitamin D supplementation as 10,000 IU, while the Institute of Medicine (IOM) and the European Food and Safety Authority recommend a value under 4,000 IU per day (100 μg). Most countries have recommended the upper level as 2,000 IU per day (50 μg) for adults.[3]

However, clinical studies on dose-response relationships or toxicity studies have shown that there are no adverse effects following an intake of 1,250 μg (50,000 IU) once every 2 weeks for several years. High doses do not cause hypercalcemia or other evidence of hypervitaminosis D.[63] Clinical studies conducted on smaller populations have also shown that even a daily consumption of up to 250 μg (10,000 IU) of vitamin D over long periods did not result in any adverse events in healthy adults.

Considering that the recommended daily dose of vitamin D supplementation of up to 2,000 IU may lead to severe side effects in the general population. Since, 800 IU is the lowest dose associated with a bone benefit, a recommended daily dose of 20 to 50 μg is reasonable.[64] A daily vitamin D of 800 IU is adequate to achieve a

Table 3. Daily Vitamin D Dosage Recommended by Different Societies and Organizations

Recommendation from	Vitamin D recommendation
United States RDA	200 IU/day in men and women ≤50 years
Vitamin D Council	2,000 IU vitamin D daily ≤60 years
IOF	800 to 1,000 IU/day in men and women
ICMR-NIN	600 IU/day in adult men and women 800 IU/day in men and women >60 years

RDA = Recommended Dietary Allowance; IOF = International Osteoporosis Foundation; ICMR-NIN = Indian Council of Medical Research-National Institute of Nutrition.

target of at least 20 ng/mL in most healthy individuals. However, 2000 IU is sufficient to achieve a level at least 30 ng/mL. Clinical data has also pointed out that a level higher than 20 ng/mL may be needed for optimal risk reduction in several cases.[3]

The results of a study showed that after a normal level of 25(OH)D is reached, the daily maintenance dose of 2,000 IU was inadequate to achieve and stabilize the level of 25(OH)D at ≤30 ng/mL. The daily dosage has increased from 400 to 2,000 IU per day to maintain normal levels. However, an adequate maintenance dose is required to prevent recurrent deficiency, irrespective of the initial dosage. National Health Service in the United Kingdom has recommended a daily dose ranging between 800 to 2,000 IU per day but opined to raise the dose up to 4,000 IU daily. However, the study supported the fact that supplementation is the only source of vitamin D, and obese individuals require 2 to 3 times higher doses compared to individuals with normal weight.[65] Table 3 shows the recommended doses of vitamin D by different societies and official bodies.

Based on several studies, it has been suggested that vitamin D deficiency is defined as 25(OH)D below 20 ng/mL, insufficiency as 25(OH)D of 21 to 29 ng/mL, and sufficiency as a level of 25(OH)D of 30 to 100 ng/mL.[22] Figure 1 gives an algorithm giving a step-by-step approach to assessing and managing vitamin D deficiency.

7 Ds of Vitamin D Supplementation

Demand

- Vitamin D deficiency has assumed pandemic proportions.
- Indian studies show prevalence ranging from 50% to 94%.

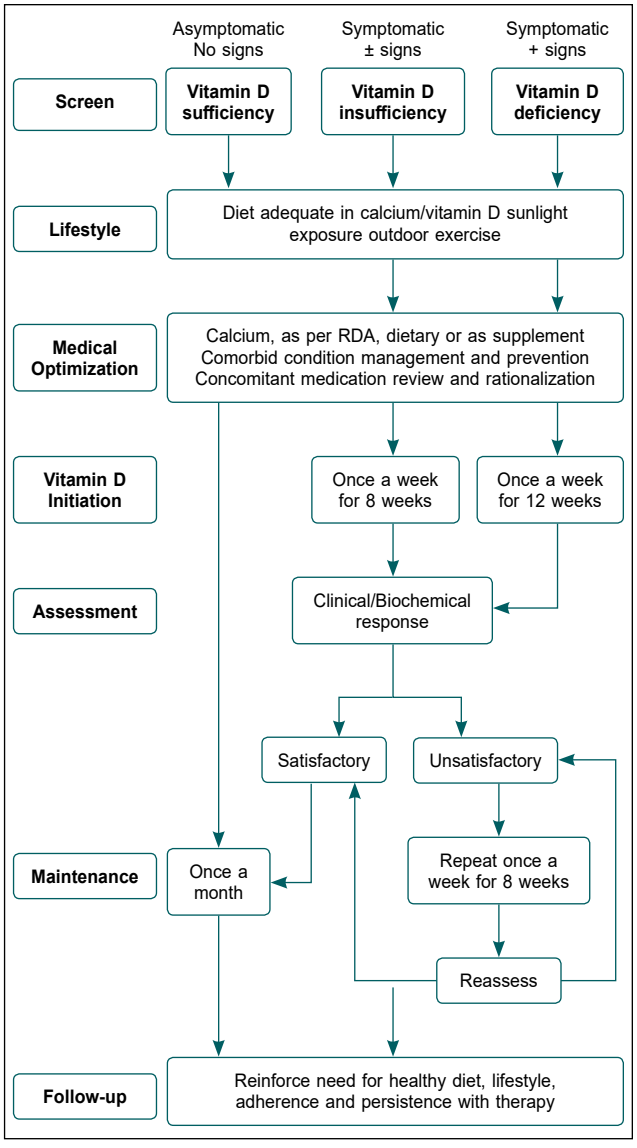

Figure 1. The clinical approach to managing individuals with vitamin D insufficiency.

- India is a heliophobic country leading to an inadequate exposure to sunlight, resulting in insufficient levels of vitamin D.
- Vitamin D deficiency has been implied in multiple systems; cardiometabolic disorders, essential for bone health in children and adults, and MOAN syndrome.
- Included in WHO Model List of Medicines 2021 and National List of Essential Medicines 2022.

Dosage

- Asymptomatic individuals: 800 to 2,000 IU per day.
- Symptomatic, vitamin D insufficient: Up to 6,000 IU per day.

- Symptomatic, vitamin D deficient: Up to 6,000 IU per day.

Duration

- Asymptomatic individuals: 800 to 2,000 IU once a month.
- Symptomatic vitamin D insufficient: Up to 6,000 IU
  - Initiation dose: Once a week for 8 weeks
  - If unsatisfactory, once a week for 8 weeks
  - Maintenance dose: Up to 60,000 IU, once a month.
- Symptomatic vitamin D deficient: Up to 6,000 IU
  - Initiation dose: Once a week for 12 weeks
  - If unsatisfactory, once a week for 8 weeks
  - Maintenance dose: Up to 60,000 IU, once a month.

Dynamics

- The recommendation for supplementation should be indication based.
- Vitamin D supplementation dependent on season, age, body weight and other risk factors including susceptible individuals including elderly >65 years, hospitalized individuals, women planning pregnancy and in patients with osteoporosis with an increased risk of falls. *OR*
- Patient should be referred for vitamin D supplementation
  - Lack of improvement
  - Malabsorption
  - Hypercalcemia
  - Associated kidney disease or hepatic disease
  - In individuals post-bariatric surgery.

Delivery

- Available in the form of tablet, capsules, soft gel capsules and syrups.
- Preferred drug formulation may be customized based on ease of administration and the patient compliance.

Desirability

- In the general population, desired serum levels following supplementation with initiation and maintenance dose should be 40 to 60 ng/mL.
- Vitamin D insufficient levels: ≥20 to <30 ng/mL.
- Vitamin D deficient levels: <20 ng/mL.

Direction

- Education and awareness of general practitioners on vitamin D deficiency
  - Desired serum levels, recommendations for indications, loading and maintenance dosages needed.
  - Reinforce need for healthy diet, lifestyle, adherence and persistence with therapy.
- Public awareness about
  - Importance of sunlight exposure for vitamin D production.
  - Lifestyle factors, diet, vitamin D-fortified food.
  - Vitamin D supplements availability, required dosage and formulations.

AWARENESS OF VITAMIN D DEFICIENCY

It is known that a lack of knowledge and awareness of vitamin D deficiency acts as a potential risk factor for vitamin D deficiency.[66] A study on children showed that most individuals with vitamin D deficiency are unaware of vitamin D sources.[67] There is a need for an improved campaign for awareness, knowledge and attitudes regarding vitamin D.

Several factors work at the heart of a successful eradication program. In case of vitamin D deficiency, it can be integrated with other programs running under the Ministry of Health and Family Welfare, such as maternal and child health programs (Janani-Shishu Suraksha Yojana, Janani Suraksha Yojana, Pradhan Mantri Surakshit Matritva Abhiyan, etc.), national program for health care of the elderly and noncommunicable disease control programs. Health care professionals need educational programs to create awareness about vitamin D assessment and supplementation.

CONCLUSION

Vitamin D deficiency could be symptomatic or subclinical, with a continuously rising prevalence. Hence, there is a clear need to educate the public and health care professionals about the prevention of deficiency through supplementation, diagnosis through targeted testing, especially in high-risk individuals, and adequate treatment, maintenance and monitoring.

Vitamin D is implicated in bone health, attributing to increased fractures and susceptibility to falls in individuals who are vitamin D deficient. Unarguably, vitamin D has also emerged as an independent risk factor for various CVDs, including MI and coronary heart disease.

Considering vitamin D prevalence in the general population and its clinical manifestations, we recommend the following dosage and duration of vitamin D: (a) Asymptomatic individuals – 800 to 2,000 IU, once every 30 days. (b) Symptomatic vitamin D insufficient – Up to 6,000 IU - initiation dose is once a week for 8 weeks and maintenance dose up to 60,000 IU, once a month. (c) Symptomatic vitamin D deficient – Up to 6,000 IU - initiation dose is once a week for 12 weeks and maintenance dose up to 60, 000 IU, once a month.

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CLINICAL STUDY

A Questionnaire-based Survey on Treatments and Practices of Antibiotics in URTI and Fever of Unknown Origin in India

SURYA KANT*, PRANJAL TRIPATHI†

ABSTRACT

India is the largest consumer of antibiotics in the world. High antibiotic consumption is linked to the emergence and community spread of multidrug-resistant bacteria. It is well-established that antibiotic overuse is one of the leading causes of antibiotic resistance, which is a major global public health challenge. Optimizing antibiotic usage is, thus, an essential issue. Before promoting and defining judicious antibiotic prescribing, it is crucial to analyze practitioners' diagnostic and prescribing practices. Hence, a nationwide retrospective questionnaire-based survey was conducted among 950 Indian doctors. This survey aimed to describe the approaches and practices of Indian doctors towards antibiotic use in upper respiratory tract infections (URTIs) and pyrexia of unknown origin (PUO) and compare practices with national guidelines. These are the most common reasons for primary health care consultations and significantly contribute to the overuse of antibiotics. According to the survey, amoxicillin-clavulanic acid remains the first-line antibiotic for URTI treatment. Third-generation cephalosporins were found to be the most prescribed antibiotics for PUO, uncomplicated typhoid and infections during pregnancy. Our survey results show that most of the clinicians in our study were well aware of the guidelines for antimicrobial use issued by Indian Council of Medical Research (ICMR) and the nationwide problem of antimicrobial resistance. This study provides an important insight into the prescribing practices of antibiotics among Indian doctors.

Keywords: Antibiotic usage, URTI, PUO, Questionnaire survey

High antibiotic consumption is linked to the emergence and spread of multidrug-resistant bacteria in the community.[1] The number of deaths in Asia due to antimicrobial resistance (AMR) is projected to rise to 4.7 million by 2050.[2] It is well-established that antibiotic misuse is one of the primary causes of antibiotic resistance; therefore, optimizing antibiotic usage is an urgent necessity. India is the largest consumer of antibiotics in the world, consuming 13 billion standard units in 2010; its per capita usage climbed by 66% between 2000 and 2010.[3] Antibiotic overprescribing in primary care is mostly driven by patient expectations and demands for treatment. Other examples of inappropriate use include, prescribing a non–first-line antibiotic or an antibiotic with broad-spectrum activity for an infection that may be treated with a narrow-spectrum antibiotic.

Upper respiratory tract infection (URTI) is the most common reason for primary health care consultations and significantly contributes to the overuse of antibiotics. Primary care doctors reportedly write more than 90% of antibiotic prescriptions.[1] Viruses cause most URTIs, and antibiotics neither accelerate recovery nor prevent complications. Favipiravir has been used as an empirical therapy for influenza-like illness during coronavirus disease 2019 (COVID-19) pandemic.[4]

Clinical manifestations of URTIs range from mild catarrhal symptoms of the upper respiratory tract to influenza-like symptoms, streptococcal angina, laryngo-tracheal bronchitis and lower respiratory tract symptoms. About 5% to 15% of instances of tonsillopharyngitis are caused by Group A beta-hemolytic Streptococcus (GABHS), which, according to evidence-based medicine (EBM) and national and international guidelines, necessitates the use of antibiotics to shorten the duration of the disease and lower the risk of sequelae.[5]

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Antibiotic overuse and overprescribing in outpatient treatment may also be attributable to prescribing antibiotics for pyrexia of unknown origin (PUO) before test findings show a bacterial illness. As per ICMR, PUO is defined as "previously healthy (nonimmunosuppressed) community (urban or rural) dwelling adult (ages 19-64 years) reporting no previous medical illness or recent hospitalization (in the preceding 30 days) presenting with acute onset of fever >38.3°C (101.0°F) for >2 days and lasting up to 14 days and having received no specific treatment for this current illness with antimalarials or antibiotics". It is associated with no organ-specific symptoms at onset.[2] These primarily include malaria, arboviral infections (such as dengue), enteric fever and viral and zoonotic bacterial diseases (such as scrub typhus and leptospirosis). PUO at the public primary health care level is associated with a high rate of the previous self-treatment, diagnostic considerations that are not very specific, polypharmacy and a high rate of antibiotic prescriptions. It includes tropical infectious diseases like dengue, scrub typhus, murine typhus, leptospirosis and enteric fever, which continue to contribute substantially to the febrile disease burden throughout Southeast Asia. The paucity of data and access to affordable, sensitive and specific diagnostic methods hinder targeted and effective treatment of severe acute infections and lead to further development of AMR.[6]

A stewardship program adopting rational antibiotic use is required to limit irrational antibiotic use. Antimicrobial stewardship is an urgent necessity and the only proven approach to avoid human overuse and abuse of antimicrobials, one of the primary causes of AMR. In May 2015, the World Health Assembly passed a resolution endorsing a global AMR action plan.[2]

It is important to consider clinicians' diagnostic and prescribing practices before encouraging and delineating prudent antibiotic prescribing. This study was conducted among doctors to assess their clinical practices and preferred antibiotic options for URTI, fever of unknown origin, typhoid, infections in pregnancy.

METHODS

Study Design and Setting

The study was a retrospective study conducted via a questionnaire-based survey among all antimicrobial-prescribing doctors between May and September 2022. It is a mixed-method study to identify targets for quality improvement in antibiotic-prescribing practices.

Study Respondents

All qualified doctors (General Practitioners, Pediatricians, Physicians and ENTs) practicing modern medicine were eligible for the survey and were approached to participate. The survey intended to include doctors across all clinical departments, work experience and professional hierarchy to ensure the representation of different antibiotic practices.

In this study, 950 Indian doctors prescribing antibiotics participated in the questionnaire survey on treatment options for URTI and fever of unknown origin and practice toward antibiotic usage.

Data Collection

The survey tool, in the form of a closed-ended questionnaire, was developed by an expert panel comprising a physician, a microbiologist and a pharmacologist. The questionnaire was specifically focused on the study aims and tailored contextually to fit local situations.

RESULTS AND DISCUSSION

Antibiotic Use in URTI

The choice of antibiotics as first-line treatment is represented in Figure 1 and Figure 2. About 39% of the respondent clinicians chose the combination of amoxicillin-clavulanic acid as the first-line antibiotic for URTI treatment. They chose penicillins, cephalosporins, macrolides and combinations thereof as an option for treating URTI. The indication of the first-line antimicrobial choice however varies according to the established etiology. In this study, most respondents adhered to the guidelines with slight modifications depending on etiology. In 1993, Neu et al reported a literature review of 415 publications detailing the clinical use of amoxicillin-clavulanic acid spanning 1979 to 1992. A total of over 38,500 patients were treated with this combination, and clinical efficacy rates (cure or improved) were 88% and 92% in comparative and uncontrolled trials, respectively.[7] However, there was an increase in the usage of specific antibiotics during the COVID-19 pandemic period. According to a survey conducted in Egypt, the most often prescribed antibiotics in 2019 were third-generation cephalosporins (42.9%), combinations of penicillins, including beta-lactamase inhibitors (16.51%), fluoroquinolones (15.25%) and carbapenems (9.16%). In 2020, the most often prescribed antibiotics were third-generation cephalosporins (30.47%), macrolides (15.12%), fluoroquinolones (14.74%) and amoxicillin-clavulanic acid, including beta-lactamase inhibitors (12.68%).[8]

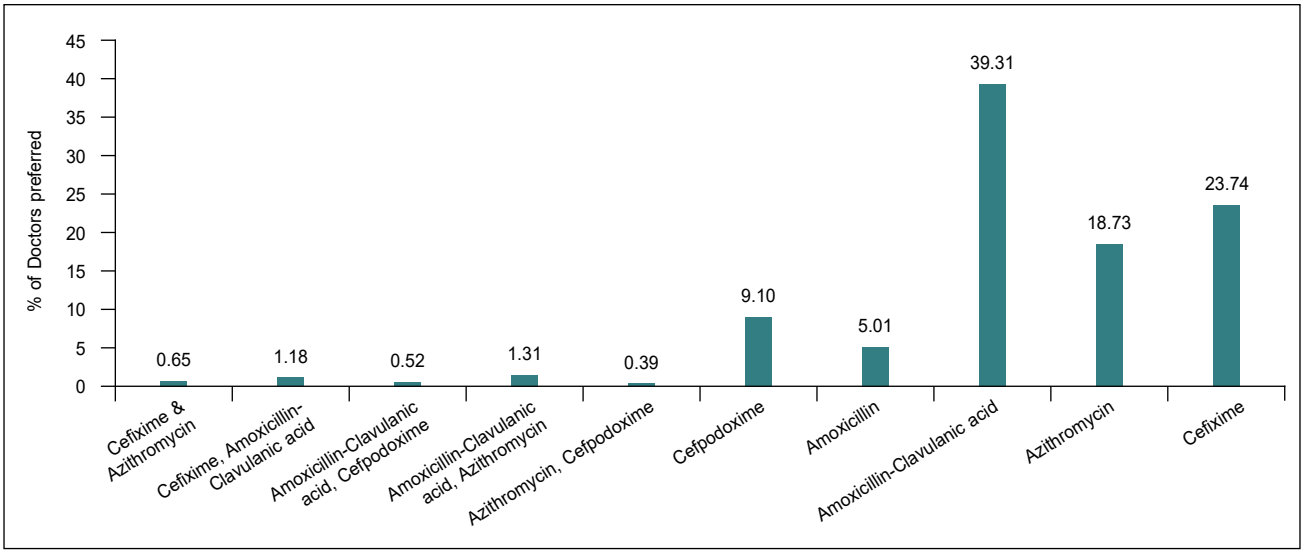

Figure 1. Percentage of antibiotics chosen as first-line for treatment of URTIs.

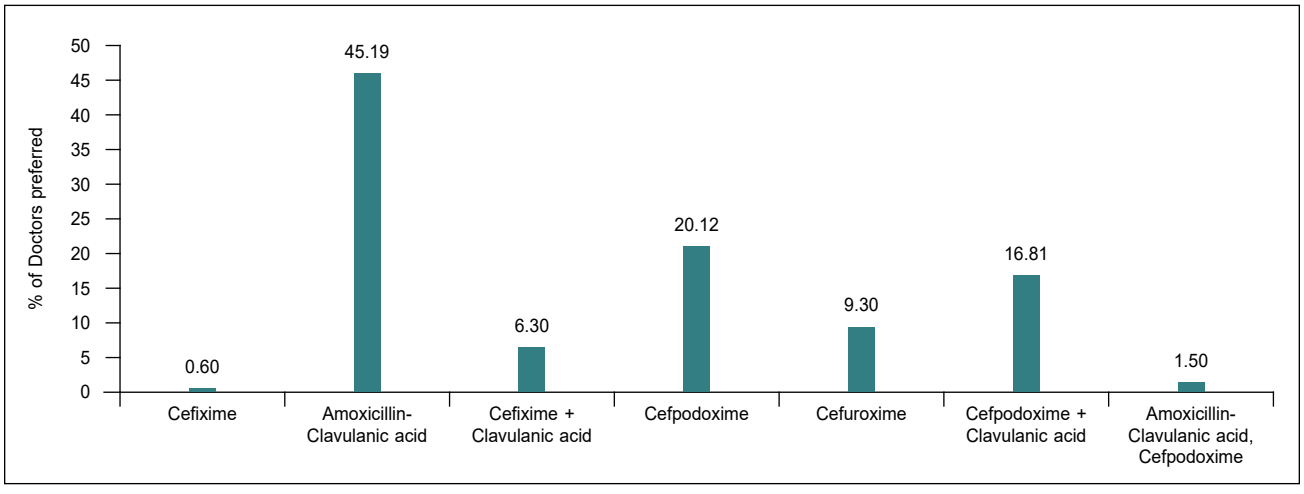

Figure 2. Preferred antibiotics in moderate URTIs.

URTIs are the most common reason for antibiotic prescription in an outpatient department (OPD). Several factors, like self-medication and pressure on providers by patients to prescribe or dispense antibiotics, etc., influence the high and unjustified antibiotic use in a common ailment. URTIs include rhinosinusitis, acute otitis media (AOM), pharyngotonsillitis and laryngitis.[9] Viruses are responsible for the great majority of URTIs. Therefore, antimicrobial treatment is not always required.[10] Paracetamol and ibuprofen are considered as the standard analgesics.[11]

The 2019 Treatment Guidelines for Antimicrobial Use in Common Syndromes issued by Indian Council of Medical Research (ICMR) recommend amoxicillin or amoxicillin-clavulanic acid (alternative) as first-line antibiotic therapy for AOM, amoxicillin or amoxicillin-clavulanic acid for sinusitis and penicillin or amoxicillin for pharyngitis. First-line therapy represents the initial antibiotics recommended for treating patients without drug allergies, and the most common class of non–first-line antibiotics prescribed was macrolides for pharyngitis and cephalosporins for sinusitis and otitis.[2]

Amoxicillin-clavulanic acid provides improved coverage for beta-lactamase-positive *Haemophilus influenzae* and drug-resistant *Streptococcus pneumoniae*. Alternatives (e.g., doxycycline, levofloxacin) are used only for patients allergic to amoxicillin-clavulanic acid. Alternative initial antibiotics include cefuroxime or cefpodoxime, respectively.[2] For children, the second-line antibiotics include a high dose of amoxicillin-clavulanic acid combination, levofloxacin and moxifloxacin or the combination of clindamycin plus a third-generation oral cephalosporin (cefixime or cefpodoxime).

Pneumococcal resistance in nonmeningeal isolates is very low in India; hence, standard doses of amoxicillin generally suffice. Conversely, pneumococcal resistance to co-trimoxazole and macrolides is widespread.[12]

Antibiotic Use in Pyrexia of Unknown Origin

Around 56.5% of respondents chose cefixime as the first-line of treatment for PUO, followed by amoxicillin-clavulanic acid (18%), cefpodoxime (12%) and azithromycin (11%) (Fig. 3). Literature suggests that empirical therapy with a third-generation cephalosporin (ceftriaxone) and doxycycline or azithromycin is appropriate, while diagnostic confirmation is awaited.[12]

Although azithromycin sensitivity testing has not been verified, the response has been positive in the majority of clinical studies.[2]

However, defervescence periods with third-generation cephalosporins are much longer compared to other classes, and bone marrow suppression is a problem with chloramphenicol. Enterobacteriaceae (*Escherichia coli* and *Klebsiella*) are increasingly resistant to quinolones (up to 80%) and third-generation cephalosporins (up to 75% due to extended-spectrum beta-lactamases [ESBL] development). Initial empiric therapy for infections caused by these organisms, pyelonephritis, severe intra-abdominal infections (IAI), etc., should consist of a drug active against ESBL producers, such as a carbapenem or a beta-lactam/beta-lactamase inhibitor for less severely ill patients. Community-acquired organisms such as *Staphylococcus aureus* are usually susceptible to methicillin, i.e., standard anti-staphylococcal drugs such as cloxacillin and first cephalosporins may be used. Penicillin still remains the drug of choice for pneumococcal infection.[13,14]

Antibiotic Use in Uncomplicated Typhoid or Paratyphoid

Antibiotic therapy shortens the clinical course of enteric fever and reduces the risk of death. The majority of survey respondents selected cephalosporins and fluoroquinolones as the conventional treatment for uncomplicated typhoid and paratyphoid (Fig. 4). Fluoroquinolones (such as ciprofloxacin) are often used for the empiric treatment of enteric fever in adults and are considered the treatment of choice for fluoroquinolone-susceptible infections. Most of the *Salmonella* typhi and paratyphi A infections in South Asia are found to be fluoroquinolone-nonsusceptible or nalidixic acid-resistant, which suggests that treatment failures may occur among patients treated empirically with fluoroquinolones. Resistance to quinolones is high, reaching up to 69% for *S.* typhi and 23% for *S.* paratyphi A. Trimethoprim/sulfamethoxazole, chloramphenicol and third-generation cephalosporins have modest resistance rates.[2]

Cephalosporins are a large family of antimicrobial medicines, which are commonly used to treat a variety of infectious diseases. Individual cephalosporins (such as cefixime and ceftriaxone) differ in the pathogens they are able to treat, how they are administered (orally or intravenously), and when they are produced. *S.* typhi and *S.* paratyphi A, B and C, the bacteria that cause enteric (typhoid) fever, can be treated with certain cephalosporins.[15]

There is limited evidence on the superiority of azithromycin over first-line antibiotics, fluoroquinolones and cephalosporins, even when used in people infected with multidrug-resistant or nalidixic acid-resistant strains of *S.* typhi or *S.* paratyphi or both. Available

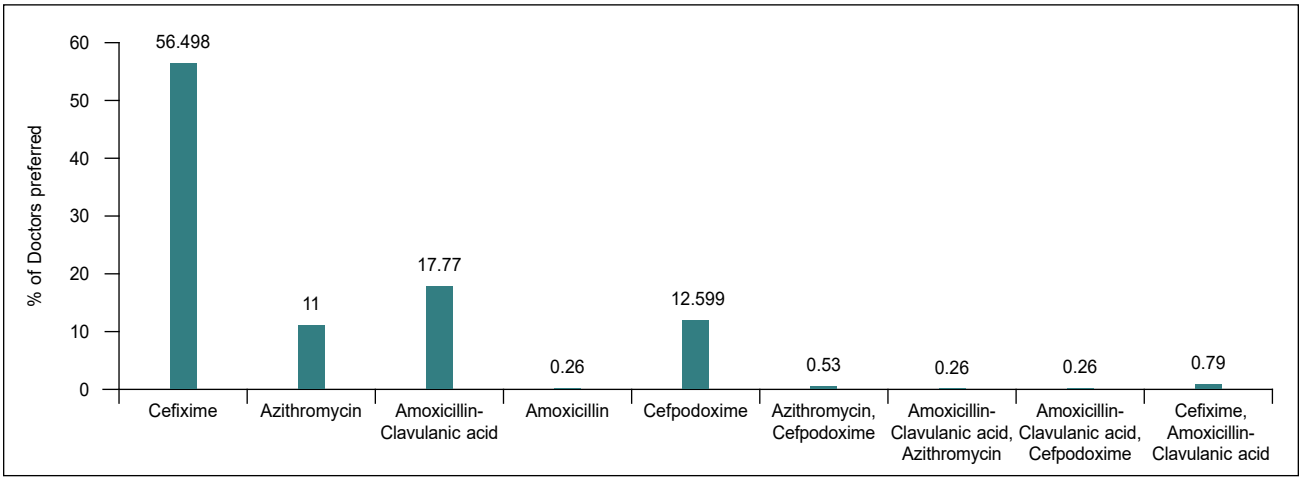

Figure 3. Choice of antibiotic in pyrexia of unknown origin.

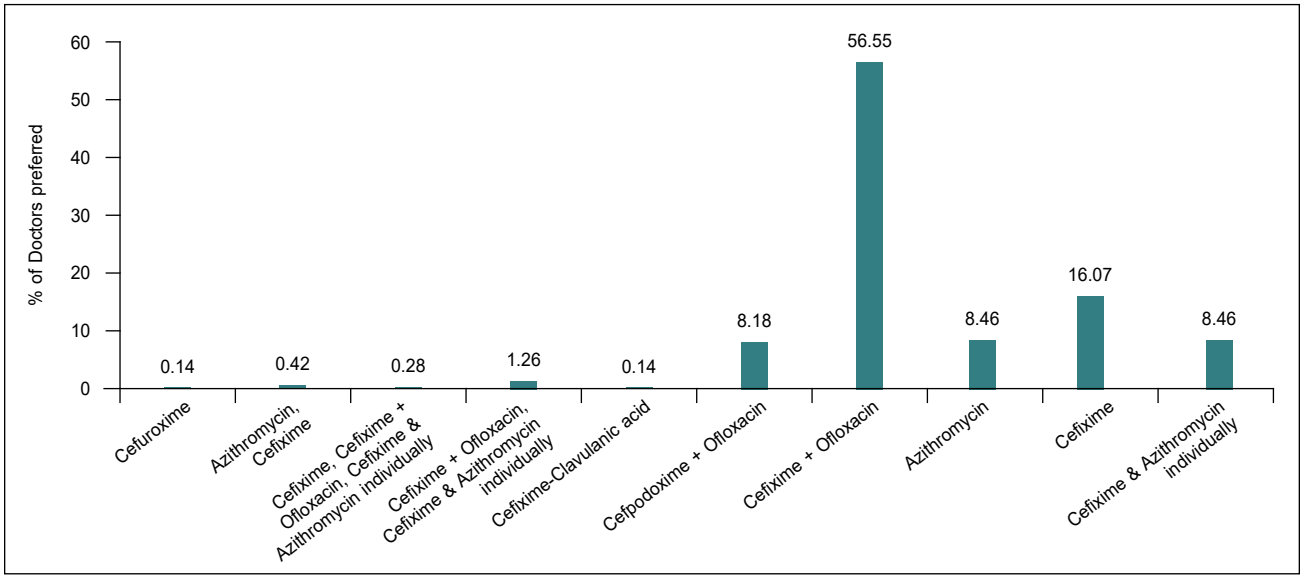

Figure 4. Preference of antibiotics in uncomplicated typhoid or paratyphoid.

evidence shows that azithromycin is as good as the other comparator drugs for most outcomes and is better than fluoroquinolones in terms of reducing clinical failure and duration of hospital stay and ceftriaxone in terms of reducing relapse. Taking into consideration, the potential for the development of resistance to any new antibiotic introduced, azithromycin is used guardedly to prevent the emergence of strains resistant to the drug.[12]

Effectiveness of Antibiotic Combinations with ESBL Inhibitors

Antimicrobial combinations serve a crucial role in clinical therapies despite the inherent disadvantages of utilizing numerous medicines. The clinical benefits of antimicrobial combinations in certain situations have been appreciated for decades. Our survey strongly supports this (Fig. 5). Fifty-six percent of clinicians believed that the combination of an antibiotic with an ESBL inhibitor is beneficial. Beta-lactamase inhibitors (e.g., clavulanic acid, sulbactam, tazobactam) protect beta-lactams from enzymatic hydrolysis, enhancing their spectrum of activity against various ESBLs. A stronger bactericidal impact may be achieved by combining cell wall-active medicines with aminoglycosides, beta-lactams with inhibitors of beta-lactamase, and medications that inhibit different steps along a key metabolic pathway. The rationale is that combination therapy may be advantageous when resistance to a single agent develops rapidly.[13]

AMR poses an enormous global public health challenge. Beta-lactamase inhibitors are medications used

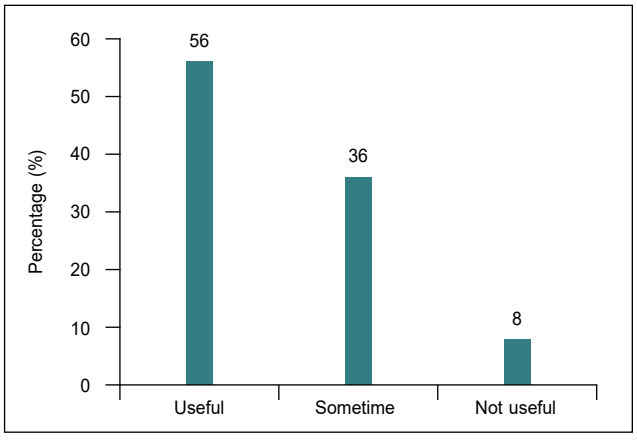

Figure 5. Effectiveness of antibiotic combination with ESBL inhibitor.

ubiquitously in modern medicine because they can combat bacterial AMR mechanisms. Therefore, careful monitoring and prescribing of patients taking beta-lactamase inhibitors in combination with beta-lactam antimicrobials are paramount.[13,15]

Antibiotics to Manage Infections in Pregnancy

It is common for antibiotics to be prescribed during pregnancy for infections. Treating infections during pregnancy is important as untreated infections can have adverse effects on the mother and baby. However, the type of medication must be selected with care. Certain antibiotics are safe to take while pregnant, while others are not. Penicillins, most cephalosporins and azithromycin are considered first-choice options during pregnancy. In this survey, most of the clinicians preferred cefixime as the first choice of antibiotic to manage

infections in pregnancy (Fig. 6).[16] Examples of penicillin antibiotics include amoxicillin and ampicillin. Health care providers may also choose to prescribe the combination of amoxicillin-clavulanic acid. This is also considered a safe antibiotic during pregnancy. It can be used for infections where amoxicillin may not work well enough on its own.[17]

Multivitamins and Probiotics along with Antibiotic

Most of the clinicians (Fig. 7) in our study agreed that use of multivitamins together with antibiotics is considerable. Thirty-seven percent of clinicians favored recommending multivitamins with antibiotics, whereas 54% of professionals recommended it occasionally. Literature suggests that along with medications, additional vitamin C, vitamin D and niacin can also help treat infections. In a blinded clinical trial, intravenous vitamin C at 1,20,000 mg/day accelerated burned skin recovery. Niacin, 1,000 to 3,000 mg/day, lowers cholesterol. Doctors treating life-threatening bacterial infections have various vitamin C and niacin choices. Oral supplementation with 2,000 to 10,000 mg of vitamin C and 100 to 500 mg of time-release or "no flush" niacin is easiest.[18,19] Along with medications, additional vitamin C, vitamin D and niacin can help treat respiratory infections at home. In 2005, another study found that high doses of ascorbic acid reduced antibiotic resistance in *Pseudomonas aeuruginosa*. Taking vitamin C, kanamycin, streptomycin and tetracyclines prevents bacterial respiratory illness.[19]

Antibiotics may kill a huge number of disease-causing microorganisms. However, they also frequently kill a large number of beneficial bacteria and can cause a variety of side effects, including diarrhea.[20-22] These potential

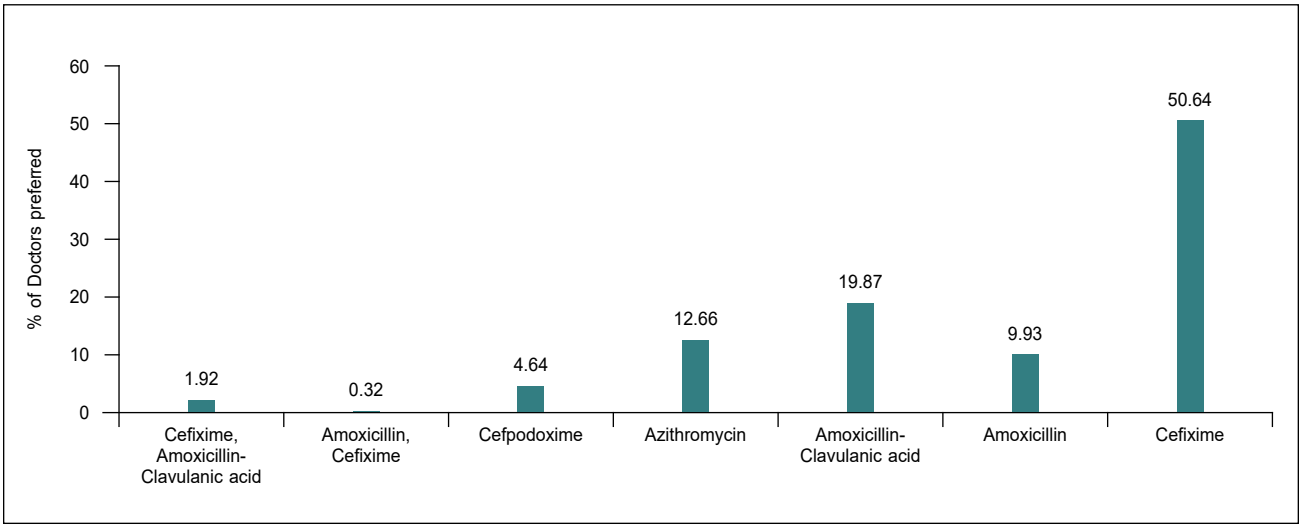

Figure 6. Prescribed antibiotics to manage infections in pregnancy.

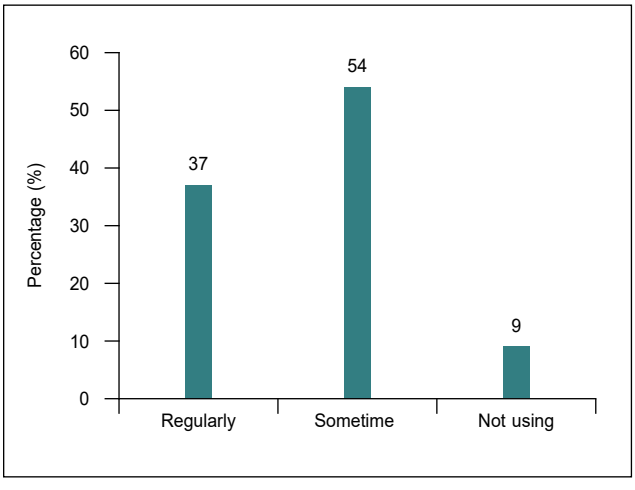

Figure 7. Frequency of using multivitamins along with antibiotics.

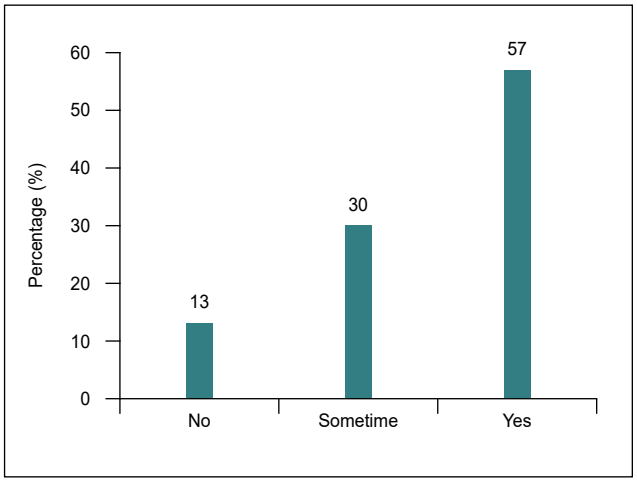

Figure 8. Frequency of co-prescribing probiotics with amoxicillin-clavulanic acid.

issues may be mitigated by probiotic supplementation. Even in the recent survey, most clinicians favored the combination of probiotics and antibiotics (57%), but only a few (30%) supported combining probiotics and antibiotics sometimes (Fig. 8). Probiotics do not render antibiotics ineffective. A randomized clinical trial investigated the efficacy of probiotic administration in addition to antibiotics. The study reported that probiotics have the ability to prevent and treat some infections.[23]

Efficient use of probiotics can potentially decrease patients' exposure to antimicrobials. As antibiotics are frequently not very selective killers, the requirement and significance of consuming probiotics while taking antibiotics has been aptly described.[22,24]

CONCLUSION

The emergence of bacterial strains resistant to antimicrobial agents presents a growing concern worldwide. Among other factors, the irrational use of antibiotics has contributed to the progressive loss of bacterial sensitivity to antibiotics and the spreading of resistant strains of bacteria, with substantial clinical and economic impact. The clinical effectiveness of antibiotics depends partially on their correct use, depending on patients, doctors and retailers.

As per our survey, cefixime is the choice of antibiotic in PUO. In uncomplicated typhoid and paratyphoid, cefixime-ofloxacin is preferred. Amoxicillin-clavulanic acid remains the first-line of treatment for URTI. A combination of ESBL inhibitors with antibiotics is effective and preferable due to its positive role in combating the development of AMR.

Hence, it can be concluded that most of the clinicians in our study were well aware of the ICMR guidelines and the nationwide problem of AMR. Also, it provides important insight into the knowledge and adherence to the guidelines and practices regarding antibiotic resistance and usage among health care practitioners.

Acknowledgment

The authors thank Aurobindo Pharma Ltd. for their technical support in the preparation of this manuscript. The authors would also like to thank all the doctors who participated in the survey.

Conflict of Interest

The author has no conflict of interest to declare for this publication.

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CASE REPORT

Scrub Typhus Presenting as Subdural Hemorrhage with Normal Platelet Counts: A Rare Case Presentation

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ABSTRACT

Scrub typhus is a common zoonotic disease with high case fatality rate. The clinical presentation of this disease may vary from acute febrile illness, thrombocytopenia, gastrointestinal manifestations, coagulopathy to neurological manifestations. The common neurological manifestations are meningitis and meningoencephalitis, whereas subdural hemorrhage, cerebrovascular accident, i.e., intracerebral hemorrhage, infarct, subarachnoid hemorrhage, etc. are among rare neurological presentations. Scrub typhus-induced neurological disease should be investigated to provide a timely and appropriate diagnosis and to reduce the mortality in complicated scrub typhus infection. Here we report a case of scrub typhus complicated with subdural hemorrhage admitted in our hospital.

Keywords: Scrub typhus, zoonotic, acute febrile illness, neurological, subdural hemorrhage

Scrub typhus also known as bush typhus or tsutsugamushi disease is a zoonotic disease, which spreads to humans through the bite of the trombiculid mite. The trombiculid mites have a four-stage lifecycle: egg, larva, nymph and adult. The infected larva (chiggers) is the only stage that can transmit the disease to humans and other vertebrates.[1] The causative organism is *Orientia tsutsugamushi* which is a Gram-negative intracellular organism. It affects people of all ages including children. Humans are accidental hosts in this zoonotic disease. A billion people are at risk and nearly a million cases are reported every year.[2] It is emerging as a notorious disease with mortality rates ranging from <1% to 50% making it a disease with serious public health issues especially in the Asia Pacific region and tsutsugamushi triangle (area of 13 million kilometers) bounded by Pakistan, India and Nepal in the West; Siberia, Japan, China and Korea in the North and Indonesia, Australia, Philippines and the Pacific islands in South.[3] Mortality depends on proper antibiotic treatment, status of the individual infected and strain of *O. tsutsugamushi* encountered.[4] This disease is commonly seen in rural areas of India and is common in farmers, geologists and military personnels. Occurrence is influenced by rainfall, with more chiggers attached to the rodents in the wetter months of the year, which may be the reason for clustering of cases during the rainy season as shown by Gurung et al.[5]

The clinical presentation may range from acute febrile illness, myalgia, arthralgia, thrombocytopenia, acute hepatic dysfunction, acute kidney injury, suffused face, eschar, pneumonitis, acute respiratory distress syndrome, myocarditis, pericarditis to severe neurological manifestations. Among neurologic symptoms are headache, altered sensorium, meningitis, acute disseminated encephalitis, meningoencephalitis, seizure, polyneuritis cranialis and cerebrovascular accident in form infarct, hemorrhage, subdural hemorrhage and cerebral venous thrombosis (CVT).[6] Subdural hemorrhage is a rare neurological manifestation reported in scrub typhus patients caused by vasculitis or severe thrombocytopenia. Very few cases had been reported from the state of Rajasthan probably due to less endemicity; however, the prevalence of scrub typhus has increased in Rajasthan since the last

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few years. Hence, we are reporting a rare case of a young patient of scrub typhus with normal platelet counts with subdural hemorrhage.

CASE REPORT

A 34-year-old male patient, nondiabetic, nonhypertensive admitted in medicine ward in MB Hospital, Udaipur with history of fever with chills, headache, malaise for last 2 days, and altered sensorium for last 1 day. There was no significant past history of seizure, head injury and drug addiction. He had no anemia, cyanosis, icterus, clubbing, edema feet, no hepatosplenomegaly on general physical examination; he was conscious but not oriented to time, place, person. All cranial nerves, deep tendon reflexes were normal with negative Babinski's sign. Signs of meningeal irritation – neck rigidity, Kernig's sign were absent. All vital signs were normal (blood pressure was 130/80 mmHg, pulse rate was 96 bpm, respiratory rate was 16 breaths/min), except he was febrile and temperature was 39.6°C (oral).

Auscultation of both lungs revealed normal vesicular breath sounds and no added sounds. Due to the acute febrile illness, a tentative diagnosis of malaria, dengue fever or scrub typhus was suspected. The patient was investigated. The complete blood count (CBC) was normal except for white blood cell (WBC) count, which was raised (24.5×10^3) on day of admission. It came down to normal on day 3 (10.3×10^3). His liver and renal function tests were absolutely normal (urea - 22.6 mg/dL, creatinine - 0.7 mg/dL, total bilirubin - 1.01 mg/dL, serum glutamic-oxaloacetic transaminase [SGOT] - 30 IU/L, serum glutamic-pyruvic transaminase [SGPT] - 25 IU/L, alkaline phosphatase [ALP] - 66 IU/L). Ultrasonography abdomen and chest X-ray were normal. The patient underwent specific investigations for acute febrile illness. Dengue IgG, IgM, NS1 antigen were negative, malaria parasite testing by slide and QBC (Quantitative buffy coat) test was found negative but scrub typhus IgM ELISA (enzyme-linked immunosorbent assay) was positive. Noncontrast computed tomography (NCCT) head was done and showed subdural hemorrhage along the falx. Magnetic resonance imaging (MRI) brain was done and showed early subacute subdural hemorrhage in parafalcine location in bilateral frontal region (Fig. 1). Patient was treated with IV mannitol, IV antiepileptic (phenytoin) along with symptomatic treatment in the form of antibiotic doxycycline, antimalarial, antipyretic and IV fluid, etc. On the third day of admission, improvement in sensorium was seen and the fever subsided. Hence, a diagnosis of scrub typhus with subdural hemorrhage was made.

DISCUSSION

Scrub typhus is a common mite-borne zoonotic disease distributed mainly in the tsutsugamushi triangle; India is one of the part of this triangle. In India, Himachal Pradesh and Jammu Kashmir are endemic for scrub typhus. There are reports of scrub typhus outbreaks in Himachal Pradesh and Sikkim during 2003-2004 and 2007. But from last few years, this disease has drawn the attention of clinicians in Kerala, Tamil Nadu, West Bengal and Rajasthan also. In Rajasthan, there is a sharp increase in number of cases in the last 5 to 7 years. It is primarily the disease of rural population but since past few years, some cases from urban population also reported. Scrub typhus cases are mainly seen in rainy seasons (July to October) and sporadic cases have been reported throughout the year. The presentation varies from mild self-limiting disease to fatal one leading to death. After an incubation period of 6 to 21 days, onset is characterized by fever, headache, myalgia, cough and

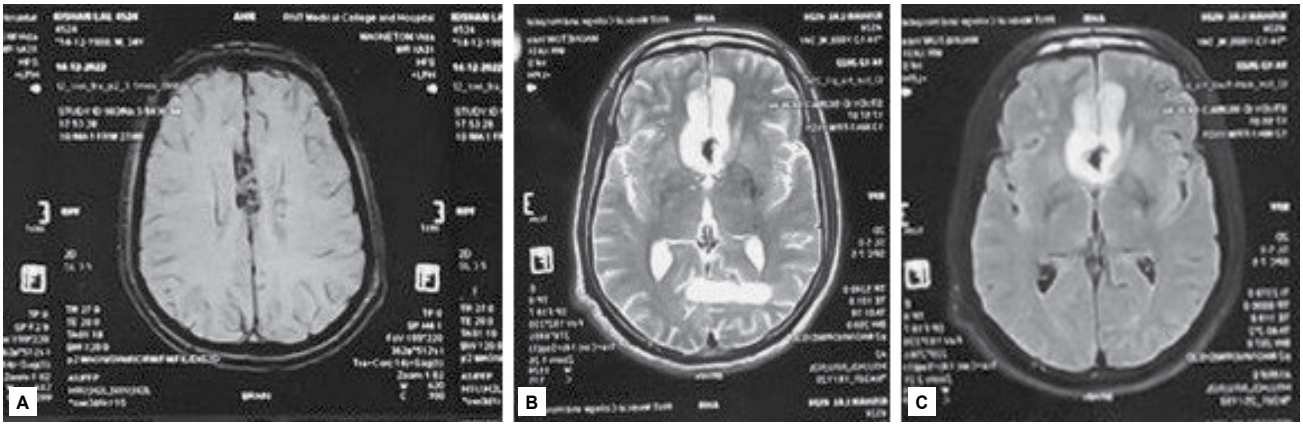

Figure 1. SWI Image shows blooming along parafalcine location (**A**). T2W (**B**) and FLAIR (**C**) images show hyperintensity involving cortical as well as subcortical white matter in bilateral parafalcine frontal location.

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gastrointestinal symptoms. Diagnosis is made by serologic assays (indirect fluorescent antibody, indirect immunoperoxidase and enzyme immunoassays). The gold standard is indirect immunofluorescent antibody.[7] Molecular detection using polymerase chain reaction (PCR) is possible from skin rash biopsies, lymph node biopsies or ethylenediamine tetraacetic acid blood. GroEL-based real-time PCR assays are more sensitive and give a more quantitative assay.[8]

Patients are treated predominantly by using antibiotic such as doxycycline/azithromycin/rifampicin/chloramphenicol singly or in combination. Oral/IV doxycycline (100 mg twice daily for 7-15 days), azithromycin (500 mg for 3 days) or chloramphenicol (500 mg 4 times daily for 7-15 days) is usually required. A few patients may present with thrombocytopenia, acute hepatic dysfunction, acute respiratory distress syndrome, acute myocarditis, acute kidney injury, meningitis, encephalitis, meningoencephalitis, subdural hemorrhage and intracerebral hemorrhage, etc. and there is a risk of multiorgan dysfunction. Neurological manifestations are a rare complication in scrub typhus patients and their exact incidences are yet to be documented. Subdural hemorrhage is a rare neurological presentation in these patients and is caused due to extensive vasculitis or due to reduced platelet counts. There are very few cases of subdural hemorrhage reported with normal or mild decrease in the platelet counts and the probable mechanism may be vasculitis (as occurred in our case where platelet count was 469 lakh/mm^3 on day first to 362 lakh/mm^3 on subsequent days). Scrub typhus exaggerates immune response causing widespread vasculitis and perivasculitis characterized by proliferation of the pathogen in endothelial cells of microvascular system followed by infiltration of monocytes, plasma cells and lymphocytes leading to edema/necrosis in peripheral tissues.[9]

It therefore manifests as meningitis, encephalitis, acute neuropathy, multiple cranial nerve involvements (2nd, 3rd, 6th, 7th and 8th), CVT, intracerebral infarct and hemorrhage and subdural hemorrhage. A study done by Texier et al[10] shows that in patients of scrub typhus, various foci of vasculitis in the form of lymphocytic infiltration of blood vessels are seen.

CONCLUSION

Scrub typhus is now endemic in various parts of India. Subdural hemorrhage is a rare neurological complication of scrub typhus. The mortality rate documented is up to 50% in untreated patients, especially in patients with multiorgan dysfunction. Hence, it is advisable that a patient of acute febrile illness must be evaluated for scrub typhus and patients presenting with fever along with neurological manifestations even with normal platelet counts or mild thrombocytopenia must undergo neuroimaging as soon as possible to diagnose any intracranial hemorrhage, subdural hemorrhage, subarachnoid hemorrhage or infarct and to treat accordingly. Thus, our case report draws the attention of physicians about the possibility of subdural hemorrhage even with normal platelets in association with scrub typhus.

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Medicolegal Insights

WRITE DRUG NAMES IN CAPITAL LETTERS TO AVOID PRESCRIPTION ERRORS

Doctors are known to have poor handwriting and they also use abbreviations in their prescriptions. As a result, quite often, prescriptions may be unreadable and it is often said that only chemists could decipher a doctor's prescription. This is an area that needs to be addressed by doctors as illegible prescriptions may be misread and wrongly dispensed, often with disastrous consequences.

A report '*Preventing Medication Errors*' from the Institute of Medicine (IOM) published in 2006 said, "In hospitals, errors are common during every step of the medication process—procuring the drug, prescribing it, dispensing it, administering it, and monitoring its impact—but they occur most frequently during the prescribing and administering stages."

Beneficence and nonmaleficence along with patient autonomy and justice constitute the four guiding tenets of medical ethics. Patients come to us when they are sick and as clinicians, we are trained to use our skills and knowledge to diagnose and treat them. This is the principle of beneficence 'do good' complemented by that of 'nonmaleficence', i.e., to do no harm.

The fiduciary nature of the doctor-patient relationship places an ethical obligation on the doctor to always put the interests of the patient first.

To reduce prescription errors, the Medical Council of India (MCI) has issued guidelines that require doctors to write in capital letters to that the writing is legible.

In September 2016, MCI revised its code of ethics notified as Indian Medical Council (Professional Conduct, Etiquette and Ethics) (Amendment) Regulations, 2016 - Part I. this revision required doctors to write the generic names of drugs and in capital letters so that the drugs prescribed could be easily read and dispensed. The notification read as follows: In Chapter 1-B-Duties and responsibilities of the Physician in general, Clause - 1.5 under the heading - Use of Generic names of drugs, the following shall be substituted: "*Every physician should prescribe drugs with generic names legibly and preferably in capital letters and he/she shall ensure that there is a rational prescription and use of drugs*."

IMA welcomes the new MCI gazette notification asking doctors to prescribe generic medicine in capital letters but clarifies it further. "Every physician should prescribe drugs with generic names legibly and preferably in capital letters and he/she shall ensure that there is a rational prescription and use of drugs."

Here are some examples of common prescription errors and how to avoid them.

- **Always spell the drug:** Always spell the drug if you are giving telephonic instructions. Sound-alike drugs can cause confusion.
  - E.g., the patient received Isoprin IV in place of Isoptin and nearly died.
  - E.g., Amlopress AT/80 mg; a hypertensive called up his family physician who asked him to take amlopress AT but the patient took amlopress 80 mg. After sometime he developed dizziness, flushing, palpitation, nausea and abdominal pain.
- **Never write 'U' to abbreviate the word 'units':** Do not write 'U' for units when writing prescription. Always write the complete word 'units'. It may be mistaken as zero. E.g., never write 4U insulin. The patient may be given 40 units of insulin when the doctor meant 4 U (4 units).
- **Never write the numeric after a decimal point:** The use of a trailing zero after a decimal point when writing prescription may lead to medication errors. E.g., do not write 3.0 mg. There are chances that the patient may get 50 mg; 5.0 mistaken as 50 mg if the decimal point is not seen.
- **Always write the numeric 0 before the decimal point:** Always add a leading zero when writing dose of a drug, which is <1. Lack of a leading zero may lead to a decimal point being missed. For example, never write .25 mg; instead write 0.25 mg. Otherwise there are chances the patient may take 25 mg in the first instance itself.
- **8-2-8 mistake:** The time interval should be written more clearly as 8am2pm8pm. Or, the patient may consider it to be the number of tablets to be taken 8 in the morning, 2 in the afternoon and again 8 at night.

BE 'ALERT' WHEN COMMUNICATING WITH YOUR PATIENT

Communication forms the basis of doctor-patient relationship and more often than not, it is also at the

root of many instances of conflict between the doctor and the patient or the relatives of the patient.

Professional competence is anyway expected from doctors give their medical education and qualifications, but they are also expected to be compassionate towards their patients. Patients expect their doctor to listen to them and be courteous at the same time.

Doctors are governed by regulations formulated by the MCI relating to Professional Conduct, Etiquette and Ethics. While 'Ethics' is a subject that is often in the spotlight, Conduct and Etiquette are often ignored paving the way for a deteriorating doctor-patient relationship manifesting as violence, which we often read about in newspapers or watch on TV news reports.

A patient who comes to the doctor is emotionally vulnerable. He/she is going through several emotions such as anger, sadness, anxiety, fear, etc., which may at times manifest as negative behavior. But as doctors, we should always be empathetic to our patients.

It is important to remember that etiquettes and conduct are complementary to the science of modern medicine. I have devised an acronym '**ALERT**' as a check list for doctors to improve their soft skills.

- **A**cknowledge the patient by his/her name; this is the first step across the barrier. Introduce yourself or your staff who would be involved in patient care.
- **L**isten to your patients without interrupting or cutting them short in their narration. Try not to judge them.
- **E**xplain the diagnosis, the proposed line of treatment, duration of treatment, etc. to your patients. This forms the basis of 'informed consent'.
- **R**evise: Review your instructions or the information given with the patient to make sure that they have been understood correctly. This will help improve compliance to prescribed treatment and patient participation in decision making.
- **T**hank you: Say thank you to the patient. This is courtesy. He has trusted you with his health needs.

Following this check list will foster a doctor-patient relationship that is based on mutual trust and respect… the need of the hour.

INFORM YOUR PATIENTS BEFORE TRAVELING

The doctor-patient relationship is a sacred relationship. This relationship is initiated when the patient comes to the doctor, who in turn agrees to treat him. This 'implied contract' imposes on the doctor a legal duty to exercise due skill and care in providing medical treatment. Once a doctor takes on the care of the patient, he also has a duty to provide continuity of care when he is traveling or is unable to attend to the patient.

The 'fiduciary' nature of the relationship, one that is based on trust, which the patient reposes in his doctor also places an ethical obligation on the doctor to always put the interests of the patient first. Patients rely on doctors for help in their time of need. Regulation 1.2.1 of MCI Code of Ethics requires that "…Physicians should merit the confidence of patients entrusted to their care, rendering to each a full measure of service and devotion."

So, before you undertake a case, if you are planning a visit out of town or a vacation, you still need to take care of your patients.

Communication is the key to developing and nurturing the trust in a doctor-patient relationship. So, if you are going to be away on a vacation or for a conference, etc. also convey the same to your patient. Inform them about the duration of time you would be away and the dates of your departure and return. If you have arranged for another physician to take care of your patients in your absence, then share the names, along with his or her credentials and training, with your patients also. This enables the patient to make an informed decision, whether to continue with you as his doctor. Before doing a surgery, the patient must know that you would not be there for his postop care. Take an informed consent of the patient, otherwise avoid doing the surgery.

A physician is required to be "diligent in caring for the sick" (MCI Regulation 1.1.2). Once having undertaken a case, the physician should not neglect the patient, nor should he withdraw from the case without giving adequate notice to the patient and his family (MCI Regulation 2.4).

Failing to do so might put you at risk for a medical malpractice claim.

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HCFI Dr KK Aggarwal Research Fund

Round Table Environment Expert Zoom Meeting on "Implementation Challenges in Banned Single Use Plastic Items and Plastic Waste Management"

January 29, 2023 (Sunday, 12 noon - 1 pm)

- Last year, the government banned some single use plastic (SUP) products effective from 1st July. From December 2022, plastic bags <120 micron were also banned. Polythene bags under 75 microns had already been banned in September 2021.
- Implementation of the ban is a big challenge as despite the ban, these bags continue to be used as they are easily available. The ground reality is not as it should have been after 6 months of the ban.
- Multilayered plastic (MLP) is a major challenge.
- The biggest challenge is lack of seriousness on the part of citizens. People are careless about the rules and regulations. Authorities have to work to change this mindset. As responsible citizens, we should follow these rules and stop using the banned SUP items.
- The definition of the banned items needs to be clearer as there is lot confusion among the citizens about these items. The message should very clearly trickle down the line as to what is banned and what is not.
- There is lack of awareness about the SUPs and what items are banned among the general public.
- The government authorities also do not have a thorough knowledge of what banned items are to be seized. For instance, plastic sheet if used for wrapping sweet box is banned, but if it is used to wrap some other industrial product in a manufacturing unit, it is allowed. The thickness criteria applies only to plastic carry bags, but the authorities also seize plastic sheets/rolls.
- Some ban has to be implemented at the manufacturing level. Certain bans have to be implemented at the retailer level. This rule therefore has to come out with lot of clarity. There is lot of communication gap between the various organizations involved. Training programs are required.
- The livelihood of millions of people will be affected if there is blanket ban on SUPs. The government has not come out with alternate solutions for industries, much in advance to allow for smooth transition, engaged in manufacturing the banned SUPs. The question of employment of lakhs of people makes it difficult to execute it as a blanket ban.
- There is a regular demand of such types of SUP banned items. The alternatives available are very costly and they are also available in very small quantities. Hence, parallel to the ban, the government should have developed a market for alternative products.
- Only 19 items have been banned. States have the power to include more single use items to this list. Only Sikkim has added plastic bottles to the list of banned items.
- Use of carry bags is allowed in Delhi. There is a mindset that plastic bags are SUPs and hence are banned.
- The authorities are also not clear about what actions to take. The Municipal Corporation of Delhi (MCD) has no provision for financial penalty.
- Just inspecting the stores for the banned items will not serve the purpose. The problem occurs after use. It should be intercepted at the point where it is going to be used or is being disposed after use.
- There should be knowledgeable people with powers to take action legally. There should be delegation of powers. The pollution control boards should have powers similar to the excise department. Another challenge is that the pollution control boards are understaffed and new staff is not being recruited.
- The reasons for failure should be identified and discussed to learn from them.
- The biggest challenge is of enforcement of the rules. There is no specific state machinery for this.
- Shopkeepers also complain that they do not have proper alternatives to SUPs, which acts as a deterrent for the implementation.
- India generated 41.26 lakh tonnes of plastic waste in 1 year from 2020 to 2021. Almost half of all plastic used in India in 2017 (around 160 lakh tonnes in total) was SUP.
- Most SUPs find their way into landfills and either cannot be, or are not, recycled.
- The need to tackle this problem has been identified at both the national and international level. India

was one of the 175 countries that pledged to develop a legally binding international treaty to curb plastic pollution across the world.

- The government's SUP Public Grievance App enables citizens to report and track SUP-related complaints with pictures.
- We need to control our needs in order to reduce plastic pollution.
- Public is not involved when rules are being framed.
- Instead of ban, efforts should be made to improve their recycling. There is no use of the ban if sustainable alternatives are not available.
- A complete review of the Rules is needed. A government-citizen partnership is needed to tackle the increasing problem of plastic pollution.

Participants: Dr Anil Kumar, Mr ParitoshTyagi, Dr SK Gupta, Mr Pradeep Khandelwal, Mr Neeraj Tyagi, Mr Ashish Jain, Mr Lovekesh Chandra, Ms Neena Gupta, Dr S Sharma

Round Table Environment Expert Zoom Meeting on "Green Initiatives in Union Budget 2023-24"

February 12, 2023 (Sunday, 12 noon - 1 pm)

- The Union Budget 2023-24 presented on February 1, 2023 has many green initiatives. This budget indicated the commitment of the government of India to green growth and also efforts to combat climate change.
- The budget has addressed the issues of global warming and moving towards a more sustainable future.
- Green growth has been identified as one of the seven key priorities "saptarishi" of the budget.
- A capital investment of Rs. 35,000 cr has been made by the Petroleum Ministry towards energy transition, energy security and net zero goals.
- The budget also has an investment of Rs. 20,700 cr for the creation of an inter-state transmission system for the evacuation of 13 GW of renewable energy from Ladakh. Rs. 19,700 cr has been allocated for the National Green Hydrogen Mission. There are other green initiatives including natural farming. Around 1 cr farmers will be facilitated to adopt natural farming.
- Government has to try to implement circular economy. The GOBARDhan (Galvanizing Organic Bio-Agro Resources Dhan) scheme to be established for promoting circular economy by creating 500 new 'waste to wealth' plants.
- Battery energy storage systems with capacity of 4000 MWh will be set up. Another key proposal relates to the establishment of a viability gap funding mechanism to support the creation of battery energy storage systems with a capacity of 4,000 MWh.
- The budget presents a promising outlook for India's environment and sustainable development and also the PM's vision for LiFE (lifestyle for environment) and move India towards an environmentally conscious lifestyle.
- The government has done lot of conscious efforts in bringing forward the fact that we have to take some initiatives on the environment. There is the old vehicle scrapping policy. The important thing however is how these old vehicles will be recycled.
- A consciousness has to be developed among people, even the poor, about the hazards of plastic, air pollution and such environmental issues.
- The Union Budget has lot of schemes. But it remains to be seen how they will be implemented at the ground level.
- Scrapping of old motor vehicles is not really a green initiative. This is not a boost to green initiative but boost to promote economic development. There are areas where these vehicles can be plied within prescribed limits. We accept that circular economy is a very important aspect; on the other hand, we are discarding a running vehicle just because of a time limit.
- Green budgeting aims to provide decision makers, parliament and public with a clearer sense of the potential environmental impacts of budgeting choices.
- India is the first country in the world where environment is already included in the constitution.
- India holds the key to hitting global climate change targets given its sizeable and growing energy needs.
- Budget 2023-24 devoted a fair amount of space to the green industrial and economic transition needed. With the electric vehicle (EV) revolution poised to take off as every automobile major rolls out new EV models to tap demand, the availability of indigenously produced lithium-ion batteries has become a necessity, especially to lower the cost of EVs. The Budget hearteningly proposes to exempt customs duty on the import of capital goods and machinery required to manufacture lithium-ion cells used in EV batteries.

- About 5.9 million tonnes of lithium has been found in the state of Jammu and Kashmir by the Geological Survey of India.
- Following words were completely absent in the budget speech: Nature, wildlife, environment, ecology, ecosystem, pollution and conservation (except uses such as "business environment" and "growth ecosystem"). It is a budget with a stated focus on climate action. There is a massive rise in allocation for infrastructure projects, with huge environmental implications. Collectively they demonstrate the deep contradictions in the government's approach to sustainable development.
- There is nothing in this budget that pushes the growth of renewable energy or increases consumption of renewable energy in rural areas. This is not the budget for clean energy.
- A Green Credit Program was announced to incentivize environmentally sustainable actions by companies, individuals and local bodies. While the intention is to bring about a change, there is a lack of direction as to how this scheme will be implemented.
- The budget also talked of biodiversity conservation including conserving wetlands, mangrove plantation and natural farming.
- India must ensure that financial support is directed towards low-carbon technologies. We need to find areas of environmental degradation and areas of economy where environmental degradation has the greatest impact and take steps to address them.
- The Economic Survey 2023 did not have much analysis on this front that could have informed the green budget.
- Several programs such as National Adaptation Fund, Climate Change Action, National Mission on Himalayan studies found no allocation in this year's budget.
- Our dependence on fossil fuel is around 60% to 70%. Hence, green energy is not an option, it is a necessity.
- With regard to EV policies, other than the central government policy on incentives for using EV, other states are not doing much. The EV Policy of Delhi government is considered one of the best EV policy in the country. They match the same subsidy/incentive as the central government. Rests of the states have to do more.
- We need to look at how many vehicles we want to run on the roads. This is adding to the problems for green initiatives.
- India is still a developing country and development requires many things which produce carbon. Hence, a balance is required. There is a need for regulation in the infrastructure projects that have been initiated as this is adding to the problem of pollution. The environmental and carbon footprints of these initiatives have to be identified.
- The budget allocation is very small and is not targeted to the right place. More needs to be done. There is huge gap between what is being stated and what is actually happening.
- All states have to ramp up their initiatives to cut down on emissions.
- Biomethanation can be done in the path towards green energy.
- Mitigation of greenhouse gas emissions requires decentralization of solid waste, enabling local communities to be part of the solution. This is proving to be very challenging.
- Support at the community/ward level is missing, which hinders setting up of smaller capacity units of biogas. The city plans are producing more emissions rather than reducing them. Cycle tracks and pedestrian paths need to be prioritized.
- Horticulture waste is mostly unattended. A strategy from the municipality on how to handle wood portion is needed as only leaves can be composted. The biomass from horticulture waste needs to be attended to.
- The budget does not focus much on waste management. Waste is a major cause of land, air and water pollution. Budget for decentralized waste management is lacking.
- Waste to energy plants with burn technology have been included in renewable energy. This fails the objective of being carbon neutral.
- Focus should not only be to reduce pollution but also greenhouse gases.
- Short-sighted speedy development is harmful. Guidelines are necessary and we also need to be clear about agro-based industries, techno-based industries and manufacturing industries. Else this may lead to problems in the form of natural calamities by not planning what we should have at what place.

Participants: Dr Anil Kumar, Mr Vivek Kumar, Mr Paritosh Tyagi, Mr Lovekesh Chandra, Dr SK Gupta, Dr BC Sabat, Mr Neeraj Tygai, Ms Ruchika Sethi Takkar, Dr S Sharma

Diabetes India 2022: 12th World Congress of DiabetesIndia

REDUCING CV RISK IN PEOPLE WITH DIABETES – SHOULD EVERYONE BE ON AN SGLT2 INHIBITOR?

Dr Miles Fisher, UK

Diabetologists prescribe sodium-glucose co-transporter 2 (SGLT2) inhibitors owing to their action on the kidney leading to a reduction in blood glucose by glycosuria along with the benefits such as the reduced risk of major adverse cardiovascular events (MACE), cardiovascular (CV) death, all-cause death, hospitalization for heart failure (HHF), etc. as proven by CANVAS, EMPA-REG and DECLARE-TIMI trials.

RSSDI-ESI clinical practice recommendations include the initiation of T2DM treatment with metformin along with lifestyle intervention. However, if glucose control is not achieved, dual or triple therapy is recommended based on the use of two or three oral antidiabetic agents such as sulfonylureas (SUs), glucagon-like peptide 1 (GLP-1), SGLT2 inhibitors, dipeptidyl peptidase 4 (DPP-4) inhibitors, etc.

Guidelines for diabetes management should be based on the level of cardiorenal risk rather than glycated hemoglobin (HbA1c).

PREVENTING DIABETES COMPLICATIONS – 100 YEARS ON FROM INSULIN: WHICH OF THE NEWER CLASSES WILL PREVAIL?

GLP1-RA

Prof (Dr) Aravinda J, Bengaluru

- To tackle the diabetes-related complications the need is to enroot the cause (hyperglycemia, obesity) effectively.
- GLP-1RA from many clinical trials has proven itself as a powerful agent targeting the core underlying causes. Its potential in reducing MACE and stroke is noticeable. How can we forget, how GLP-1 can improve metabolic derangement?

SGLT2 Inhibitors

Dr Purvi Chawla, Mumbai

- SGLT2 inhibitors: durable glycemic efficacy, body weight and blood pressure (BP) reduction with CV benefits and renoprotective action without a higher risk of hypoglycemia.
- These are multi-tasking, oral, inexpensive, anti-diabetic agents, here to stay.
- There is adequate guidance to use them in newly diagnosed patients, those with multiple risk factors, prior myocardial infarction, atherosclerotic cardiovascular disease (ASCVD), chronic kidney disease (CKD) and heart failure (reduced and preserved EF)-potentially in type 1 diabetes mellitus (T1DM), prediabetes.
- Body weight lowering (kg) with the highest approved doses of SGLT2 inhibitors and long-acting GLP-1 receptor agonist (GLP-1RA).
- CV outcomes in patients with type 2 diabetes (T2D) and cardiovascular disease (CVD) or high CV risk: SGLT2 inhibitors and GLP-1RAs show favorable effects on long-term CV outcome, only SGLT2 inhibitors have shown a benefit on HHF.
- In a meta-analysis of randomized controlled trials in patients with T2D and CVD or high CV risk: SGLT2 inhibitors showed a consistent beneficial effect on HHF not observed with GLP-1RAs.
- Real-world use of SGLT2 inhibitors was associated with a consistent reduction in HHF risk versus GLP-1RAs, in patients with T2D regardless of CVD status.
- Kidney outcomes in patients with T2DM and CVD or high CV risk: SGLT2 inhibitors have shown consistent kidney benefits, including slowing of estimated glomerular filtration rate (eGFR) decline and reduction of hard kidney outcomes. All SGLT2 inhibitors but not all GLP-1RAs have demonstrated benefit in slowing eGFR decline over time when compared with placebo in patients with T2DM and CVD or high CV risk.
- The risk-benefit ratio has always to be assessed before prescribing.
- Adequate counseling for urinary tract infections, genitourinary infections and appropriate hydration should always be done. It is not to be used in contraindicated patient subgroups.

RELEVANCE OF REMIX INSULIN IN INDIAN PRACTICE

Dr Rakesh Sahay, Hyderabad

- A significant contribution from postprandial plasma glucose (PPG) even at higher HbA1c in the Indian population as compared to Caucasians.
- Premix insulins are simple to start with a single injection with effective HbA1c control targeting both PPG and fasting plasma glucose.
- Patients uncontrolled on 2 or more oral antidiabetic drugs (OADs) with flexible lifestyles can be started on premix insulin and the dose can be titrated on a weekly basis.
- Premix insulin provides convenience and simplicity at initiation, titration and intensification. Premix insulin provides both convenience and efficacy to the patient and contributes a long way to achieving the patient's glycemic target.

PREVENTION OF DIABETES PANDEMIC – HOPE AND SCOPE

Prof (Dr) V Seshiah, Chennai

Exposure to a diabetic environment *in utero* is associated with increased occurrence of impaired glucose tolerance and a defective insulin secretory response in adult offspring independent of genetic predisposition to T2D.

A blood test may identify gestational diabetes risk in the first trimester. The National Institutes of Health (NIH) analysis suggests early screening could allow for lifestyle changes before the condition develops.

The influence of pre-pregnancy metabolic changes on fetal development may be mediated through modification of oocyte metabolism, predominantly of their mitochondria, through changing early embryonic growth and later growth trajectories.

Primordial prevention: Ideally peak maternal post-prandial blood glucose should be ~110 mg/dL from the preconception period but never cross 12 mg/dL at any time.

What is needed for primordial prevention?

- It is essential to take timely action from "Preconception care to confinement".
- It is important to screen all pregnant women for glucose intolerance in the first trimester (ideal 9th to 10th weeks).
- Achieving euglycemia in them ensures adequate maternal nutrition and maintains ideal body weight.
- Steps to prevent in all probability, small for gestational age and large for gestational age who are prone to develop diabetes.

EFFECT OF REMOGLIFLOZIN ON GLYCEMIC VARIABILITY: "REMIT-GV TRIAL"

Prof (Dr) Jayant Kumar Panda, Cuttack

- In monitoring, glycemic variability is proven as a very accurate measure in accessing glycemic control.
- Remogliflozin is the latest SGLT2 inhibitor with a very attractive profile.
- REMIT-GV trial shows round the clock good glycemic control with remogliflozin.
- We can use this molecule for the overall benefit of our patients including cardiac and renal outcomes.

SULFONYLUREA IN 2022: STILL STANDING TALL!

Dr SR Aravind, Bengaluru

- The role of modern SUs in the T2DM continuum:
  - Newly diagnosed
  - Uncontrolled or high HbA1c
  - Obese/overweight, with CVD/HF, with CKD
  - Elderly/high risk of hypoglycemia or long-standing T2DM or on insulin.
- All 4 gliptin trials showed CV safety but no CV benefits.
- Severe hypoglycemia and weight gain were negligible with the gliclazide-based strategy.
- SUs lower blood glucose.
- Giving too much is a problem, so we need to be cautious and careful in dosing.
- HbA1c reduction with SUs are the best among OADs and next only to insulin.

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News and Views

Adverse Pregnancy Outcomes: A Risk Factor for Future Heart Disease?

Pregnant women who experience any pregnancy-related complications such as preterm delivery, pre-eclampsia are at high risk of developing heart disease as long as 46 years after childbirth, according to a study from Sweden published in the *BMJ*.[1]

Crump et al analyzed data of Swedish women sourced from the Swedish Medical Birth Register between 1973 and 2015 who delivered a single live infant with the objective to study if adverse pregnancy outcomes had a link to the risk of ischemic heart disease (IHD), which was the main outcome measure. None of the selected study subjects had a history of heart disease. For the purpose of the study, they selected five outcomes namely preterm delivery (gestational age <37 completed weeks), pre-eclampsia, small-for-gestational age (infant birth weight <10th centile for gestational age), gestational diabetes and other hypertensive disorders of pregnancy. Small-for-gestational age was the commonest adverse pregnancy outcome in 14.3% followed by preterm delivery in ~9%.

Out of the 2,195,266 women included in the study, 667,774 (30.4%) women developed at least one adverse pregnancy outcome; 181,783 (8.3%) experienced at least two adverse pregnancy outcomes.

Nearly 4% or 83,881 women in the study group were diagnosed with IHD such as acute myocardial infarction (AMI), angina (~38%) during the follow-up period of 46 years. An independent association was observed between all five adverse pregnancy outcomes and increased risk of IHD.

After adjusting for variables like age, education, body mass index (BMI), smoking, diabetes, high blood pressure (BP), high cholesterol levels and smoking, when the risk was assessed at 10 years after childbirth, compared with women who did not have a major adverse pregnancy outcome, those women who had had other hypertensive disorders of pregnancy such as chronic hypertension, gestational hypertension were twice as likely to develop IHD with adjusted hazard ratio (aHR) of 2.09. The risk increased 1.5-fold among women with pre-eclampsia, 1.7-fold in women with preterm delivery, 1.1-fold in those who delivered a small-for-gestational age infant and 1.3-fold in those with gestational diabetes.

This high-risk was seen to persist even when examined four decades (30-46 years) after delivery. The aHR for other hypertensive disorders of pregnancy was 1.47; for pre-eclampsia, the aHR was 1.32; for preterm delivery, the aHR was 1.23 and for gestational diabetes, it was 1.16. "These findings were only partially (<45%) explained by shared familial (genetic or environmental) factors in co-sibling analyses", note the authors.

The risk was found to increase as the number of adverse pregnancy outcomes increased. Those who had experienced more than one adverse pregnancy outcome were at a higher risk of IHD. The risk of IHD within 10 years of childbirth increased 1.2-fold among women with one adverse outcome with aHR of 1.29. The risk was 1.8-fold higher among women who experienced two adverse outcomes with aHR of 1.80, while the risk rose 2.3-folds among those who had experienced three adverse pregnancy outcomes with aHR of 2.26.

Heart disease is a major cause of death among women. Besides chest pain, most symptoms of heart attack in women are often different from those classically associated with heart attack such as shortness of breath, nausea/vomiting and back or jaw pain and run the risk of being ignored.

This study points out the high risk of future heart disease among women who had experienced at least one adverse pregnancy outcome allowing identification of at-risk women.

Being an observational study, it does not conclusively prove the association. Nonetheless, interventions for risk modification of cardiovascular risk factors such as obesity, diabetes, hypertension and smoking should be initiated aggressively at the earliest to prevent heart disease in women who have a history of pregnancy-related complications. A close follow-up is imperative for better outcomes.

Reference

1. Crump C, et al. Adverse pregnancy outcomes and long term risk of ischemic heart disease in mothers: national cohort and co-sibling study. BMJ. 2023;380:e072112.

Heart Patients have High Hopes Thanks to Advanced Technologies and Therapies

Recently, the two-day national convention "Cardiology Agra Live 3.0" of cardiologists and heart specialists came

to an end in Agra, Uttar Pradesh. In the convention, delegates expressed their grave concern over the alarming increase in the prevalence of cardiac diseases and argued that cutting-edge technology solutions can save the lives of heart patients. According to experts, modern eating and living patterns are contributing to an avoidable rise in the prevalence of heart ailments.

According to experts, smoking, tobacco use, obesity, high-fat diets, high cholesterol, constant use of TV and mobile devices, inactivity and a patient's family history, all contribute to the increase of blockages in the arteries of the heart. Dr RR Kasliwal, a prominent cardiologist and chairman of Vedanta, advised that people should routinely practice yoga and pranayama to keep their hearts healthy and strong.

Dr Suvir Gupta, the conference's organizing and scientific secretary, advised against taking on too much stress while offering advice on how to maintain a healthy heart. He advised that people seek medical attention if they develop cardiac problems.

Furthermore, Dr Gagandeep Singh of Medanta shared that previously, the patient had to remain in the hospital day and night to detect a heart attack. However, thanks to the high-sensitivity troponin or high-sensitivity blood test, it is now possible to determine right away whether the patient has experienced a heart attack or not. In addition, there is now a machine that can be examined in just 20 minutes and can identify a heart attack.

In the heart failure session, Dr Prabhat Aggarwal stated that although heart failure in diabetes patients continues to be a severe issue, the number of diabetic people dying from heart attacks has decreased recently due to the availability of new therapies and testing technologies. Additionally, Dr Neeraj Kumar stated that dispirin is superior to sorbitrate. Sorbitrate just lessens pain, whereas a dispirin tablet can save a life. (*Source: https://www.newkerala.com/news/2023/16725.htm*)

Study Reveals that Drinking Coffee with Milk can have an Anti-inflammatory Effect

According to a study published in the *Journal of Agricultural and Food Chemistry*, a cup of coffee with milk can have an anti-inflammatory impact on humans. The researchers stated that when proteins and antioxidants are combined, the anti-inflammatory actions of immune cells are doubled.

Researchers from the University of Copenhagen's Department of Food Science and the Department of Veterinary and Animal Sciences worked together on the study to examine how polyphenols interact with amino acids, the building blocks of proteins. They found that a polyphenol's ability to prevent immune cell inflammation increases when it interacts with an amino acid.

The researchers deliberately inflamed immune cells to test if polyphenols and proteins have anti-inflammatory effects. During the study duration, some cells were given polyphenols, while another set was given different doses of polyphenols that interacted with an amino acid.

The researchers discovered that immune cells treated with polyphenols and amino acids reduced inflammation twice as well as cells treated with only polyphenols. They claimed that previous studies have shown that polyphenols bind to proteins in meat products, milk and beer.

Dr Marianne Nissen Lund explains that the findings showed that the interaction of proteins and polyphenols occurs in some milk-based coffee beverages. She further added that the findings are promising because humans do not absorb polyphenol. As a result, scientists are looking into methods to ensure better absorption of polyphenols in the body by encasing them in protein structures. She also added that this approach has additional benefits as it strengthens the anti-inflammatory effect of polyphenols. (*Source: https://theprint.in/health/study-finds-coffee-with-milk-can-have-anti-inflammatory-effect/1355479/*)

Type 2 Diabetes Might be Reversed by Intermittent Fasting

According to a study published in the *Journal of Clinical Endocrinology & Metabolism of the Endocrine Society*, patients who completed an intermittent fasting diet intervention attained complete diabetes remission, indicated by an HbA1c (average blood sugar) level of <6.5% at least a year after ceasing diabetes medication.

The use of intermittent fasting as a weight loss strategy has grown in popularity in recent years. Dr Dongbo Liu, PhD, of Hunan Agricultural University in Changsha, China, stated that patients with diabetes can achieve remission if they reduce weight by altering their eating and exercise routines.

In the study, 36 diabetic patients participated in a 3-month intermittent fasting diet intervention. The researchers discovered that 90% of participants, including those who received insulin and blood sugar-lowering medication, decreased their diabetes medication after the diet.

The findings of the study also showed that 55% of these participants maintained their diabetes-free status

after going into remission for at least a year. The study also showed that the claims that people who have had diabetes for a shorter amount of time can only attain remission after 0 to 6 years were false. They pointed out that 65% of the participants were diagnosed with diabetes more than 6 years ago.

Dr Liu further added that for many people striving to adequately control their diabetes, the expense of diabetic drugs is a barrier. However, medicine costs dropped by 77% among participants who underwent intermittent fasting. (*Source: https://www.tribuneindia.com/news/health/intermittent-fasting-might-reverse-type-2-diabetes-reveals-study-476908*)

Future Hospitals to Act with Smart Infrastructure

Now that the pandemic has finally passed, the globe is beginning to recover and return to normal. In order to tackle systemic inefficiencies, the global health care industry has recently started to use technology.

The emergence of new technologies like artificial intelligence (AI) has revolutionized every industry, and its application in the health care sector is already changing the general patient experience and how pharmaceutical companies and hospitals run their businesses. AI is an important area of innovation, particularly in hospitals.

Better patient and staff experience: AI provides a wide range of these experiences, including employing AI to review images to speed up patient testing and diagnosis while lowering the likelihood of misdiagnosis.

Modern hospitals are improving the patient experience by monitoring patients with cameras and sensors to lower the chance of falls for patients who are vulnerable and actively monitoring patients to notify health care practitioners of any clinical changes. By using portable Edge computing devices that can collect, store, produce and analyze critical patient data, we can deliver top-notch health care to remote rural locations.

Predictive care using AI: AI will help future medical professionals and health care systems will be able to predict when a person is at risk of having a chronic condition and provide preventive actions before they get worse.

Real-time; real results: In a hospital, IT/OT integration allows medical devices to communicate and share patient data via IoT connections for real-time visibility, improving patient analysis and results. According to estimates, nearly one-third of smart gadgets now on the market are found in health care facilities.

Thus AI provides an integrated and thorough breadth of expertise in each health care facility domain. (*Source: https://health.economictimes.indiatimes.com/news/hospitals/the-importance-of-ai-for-future-ready-hospitals/97672951*)

Study Reveals Many Patients do not Receive Much Rehabilitation Therapy after Stroke

A recent UCLA-led study found that many stroke patients do not receive much rehabilitation therapy after a stroke, even though higher levels can improve long-term disability. The study followed over 500 patients across 28 acute care hospitals in the first year after a stroke. A welcome finding of the current study, published in the peer-reviewed journal *Stroke*, is that patients with more severe strokes received more rehabilitation therapy than patients with less severe strokes.

According to experts, the brain is set to undergo maximum rewiring in the first few weeks following a stroke to help patients get back on their feet. Rehabilitation therapy aids in this rehabilitation to the fullest extent possible, yet, our study revealed that most patients only receive modest amounts of rehabilitation therapy.

Results showed that many of the study's patients who were followed up did not receive any form of rehabilitation after their stroke. A third of patients had not had physical treatment, nearly half had not received occupational therapy, and more than 6 in 10 had not received speech therapy after 3 months.

Among those who received rehabilitation therapy, the typical number of sessions was 6 to 8 by 3 months following their stroke and between 0 and 1½ sessions the rest of the year.

Also, patients who were sent after being admitted to the hospital mattered. Despite the severity of the stroke, patients who were sent home received the least amount of rehabilitation therapy. Patients from Hispanic backgrounds received significantly less occupational and physical treatment.

Thus, the study concluded that future studies must look into the viability of giving stroke patients higher rehabilitation therapy doses and ensure their well-being. (*Source: https://theprint.in/health/research-reveals-patients-receive-too-little-rehab-therapy-after-stroke/1358013/*)

■■■■

What is the Importance of Life Force?

A physical body becomes useless once the life force is gone. The same body, which was lovable to everyone, becomes a liability after death. Everyone wants to dispose it as early as possible, as keeping a dead body at home is considered a bad omen.

During the transfer of dead body from one place to another, nobody wants to keep the body in a vehicle other than a hearse van, whose job is only to transport dead bodies. No family will be willing to carry the dead body of a person in a car in which the deceased person had been traveling or driving for years.

May be for any reason, health or rituals, once you touch a dead body you are required to take a bath before you commence your daily routine.

Within a matter of hours, in absence of life force, the physical body starts disintegrating and in a matter of days, it shows signs of self-destruction and putrefaction.

This vital force is nothing but the soul, aatma, brahma, spirit or consciousness, described in different Vedic texts.

Adi Shankaracharya in his book Bhaja Govindam Shloka 6 says:

Yavatpavano nivasati dehe
tavatprcchati kusalaM gehe,
gatavati vayau dehapaye
bharya bibhyati tasminkaye. (6)

"Till the life force remains in the body, people come and enquire about your welfare. But, the moment the life force goes out, even your wife is afraid of coming anywhere near your body".

Life force can be equated to the network of information in computer, radio, television or mobile phone. All these gadgets without data are useless and are thrown away. This silent data, which can be retrieved by operational and application software, represent the life force or soul of these electronic gadgets.

Just as one does not give importance to a computer without data, one should not give importance to the physical body. It is the life force within the body which is respected and cared for and that is what real "I" or "We" is. All glories of the body are only until the life force remains in it.

In Bhagavad Gita, Lord Krishna in Chapter 2 (2.23) says about this life force or ataman: "Fire cannot burn it, weapon cannot cut it, water cannot wet it, air cannot dry it; it is immortal".

Life force has no dimensions: height, weight, color or image. It is immortal, omnipotent, omniscient and omnipresent. The weight of a live and a dead body immediately after the death is the same.

It is the same life force, which dwells in everybody and during life is modified by actions, memory and desire cycles. If one gets attached to any of the three, one starts getting detached from the soul or the life force. People who are in touch with their life force all the time attain peace and happiness and die young in old age.

Most Vedic mahavakyas say that it is the same spirit, which dwells in everybody and hence every person in the society should be welcomed and treated with equal importance. Aham Brahmasami, Tat Tvam Asi, Vasudhaiva Kutumbakam, etc. are few such examples.

According to Adi Shankaracharya, one can achieve non-duality only by seeing God in everyone. "Atithi Devo Bhava" is also based on the same principle.

■■■■

INSPIRATIONAL STORY

Power of Thought: Hitting Unseen Target

Yogi Raman was a true master of the art of archery. One morning, he invited his favorite disciple to watch a display of his skill. The disciple had seen this more than a hundred times before, but he nevertheless obeyed his teacher. They went into the wood beside the monastery and when they reached a magnificent oak tree, Raman took a flower, which he had tucked in his collar and placed it on one of the branches.

He then opened his bag and took out three objects: his splendid bow made of precious wood, an arrow and a white handkerchief embroidered with lilacs. The yogi positioned himself one hundred paces from the spot where he had placed the flower. Facing his target, he asked his disciple to blindfold him with the embroidered handkerchief.

The disciple did as his teacher requested. "How often have you seen me practice the noble and ancient sport of archery?" Raman asked him. "Every day," replied his disciple. "And you have always managed to hit the rose from three hundred paces away." With his eyes covered by the handkerchief, Yogi Raman placed his feet firmly on the ground, drew back the bowstring with all his might – aiming at the rose placed on one of the branches of the oak tree – and then released the arrow.

The arrow whistled through the air, but it did not even hit the tree, missing the target by an embarrassingly wide margin. "Did I hit it?" said Raman, removing the handkerchief from his eyes. "No, you missed completely," replied the disciple. "I thought you were going to demonstrate to me the power of thought and your ability to perform magic."

"I have just taught you the most important lesson about the power of thought," replied Raman. "When you want something, concentrate only on that: no one will ever hit a target they cannot see."

■■■■

Polypill Aiming to Reduce Vascular Risk Factors may Help Slow Functional Decline

The findings of a new study published in the journal *JAMA Neurology* suggested that a polypill that targets vascular risk factors could halt the functional decline among older adults.

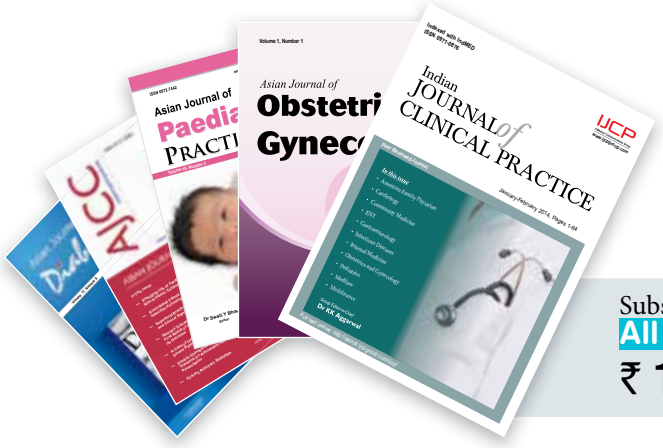
The International Polycap Study (TIPS-3) investigation revealed that its use alone or in conjunction with aspirin was not linked to a slower rate of cognitive deterioration compared to a matching placebo.

The current investigation concentrated on the cognitive and functional results of 2,098 persons older than 65 from 8 nations. Around 680 participants (32%) had low fasting plasma glucose, and 1,796 participants (86%) suffered from hypertension. The researchers used the Digit Symbol Substitution Test, which measures attention, executive function and psychomotor speed, and the Trail Making Test Part B, which measures attention for cognitive assessments. The Montreal Cognitive Assessment (MoCA), a trustworthy 30-item test for detecting mild cognitive impairment, also served as an assessment tool.

Additionally, the Standard Assessment of Global Everyday Activities (SAGEA), a 15-item patient-reported assessment of the capacity to carry out typical daily activities, was used to determine functional status.

The results showed no significant differences in the number of individuals who experienced a substantial decline (>1.5 SD) in cognitive function (356 took the polypill, and 328 took the placebo) or dementia during the 5-year follow-up period between treatment groups (polypill vs. placebo and polypill + aspirin vs. double placebo) (2 took the polypill and 4 took a placebo). Both those assigned to the polypill + aspirin and those receiving the double placebo experienced less functional impairment over the course of follow-up ($p = 0.01$ and 0.01, respectively).

Researchers further stated that larger trials with longer follow-up may be necessary to uncover subtle cognitive changes that are still significant from a population-level perspective. (*Sources: https://www.medscape.com/viewarticle/987896?src=#vp_1; https://jamanetwork.com/journals/jamaneurology/article-abstract/2800416*)



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Lighter Side of Medicine

HUMOR

WHAT IT MEANS

Five years old Becky answered the door when the Census taker came by.

She told the Census taker that her daddy was a doctor and wasn't home, because he was performing an appendectomy.

"My," said the census taker, "that sure is a big word for such a little girl. Do you know what it means?"

"Sure! Fifteen hundred bucks and that doesn't even include the anesthesiologist!"

KNOWLEDGE IS WORTH AS MUCH AS GOLD

The next day, TV news reported that 100 million was taken from the bank. The robbers counted and counted and counted, but they could only count 20 million. The robbers were very angry and complained "We risked our lives and only took 20 million; the bank manager took 80 million with a snap of his fingers. It looks like it is better to be educated to be a thief!"

This is called "Knowledge is worth as much as gold!"

GET ME A BATTLESHIP

After lunching at the Algonquin Hotel, Robert walked through the lobby, out the front door, and said to the uniformed man on the sidewalk, "My good man, would you please get me a taxi?"

The man immediately took offense and replied indignantly, "I'm not a doorman! I happen to be a rear admiral in the United States Navy."

Robert instantly quipped: "All right then, get me a battleship."

WILL I LIVE LONGER?

Patient: Doctor, if I give up wine, women and song, will I live longer?

Doctor: Not really, it will just seem longer.

LOCKS THE GATE AT NIGHT

A kangaroo kept getting out of his enclosure at the zoo. Knowing that he could hop high, the zoo officials put up a 10-foot fence. He was out the next morning, just sauntering around the zoo. A 20-foot fence was put up. Again he got out. When the fence was 40 feet high, a camel in the next enclosure asked the kangaroo, "How high do you think they'll go?" The kangaroo said, "About a thousand feet, unless somebody locks the gate at night!"

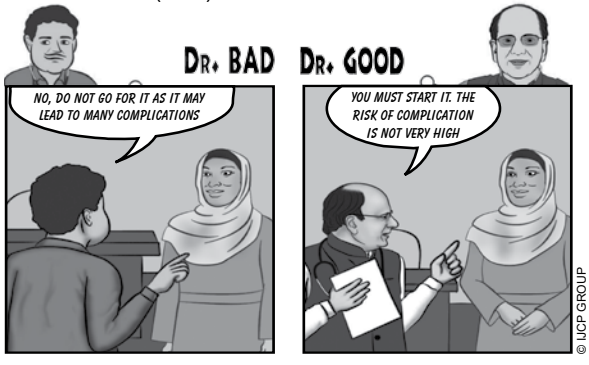
THE ANESTHESIOLOGIST

Jill received a bill from the hospital for her recent surgery, and was astonished to see a $900 fee for the anesthesiologist. She called his office to demand an explanation. "Is this some kind of mistake?" Jill asked when she got the doctor on the phone. "No, not at all," the doctor said calmly.

"Well," said Jill, "that's awfully costly for knocking someone out." "Not at all," replied the doctor. "I knock you out for free. The 900 dollars is for bringing you back around."

Dr. Good and Dr. Bad

SITUATION: A 41-year-old female with T1DM from the past 6 years had HbA1c more than 8%, despite multiple daily injections and thus was advised continuous subcutaneous insulin infusion (CSII).



LESSON: It has been reported that CSII is an effective method for improving HbA1c, particularly in patients with HbA1c more than 8% prior to initiation of CSII. The incidence and progression rates of complications such as retinopathy and albuminuria are low, especially in those with a diabetes duration less than 15 years at the time of commencement of CSII.

J Diabetes Sci Technol. 2017;11(5):924-9.

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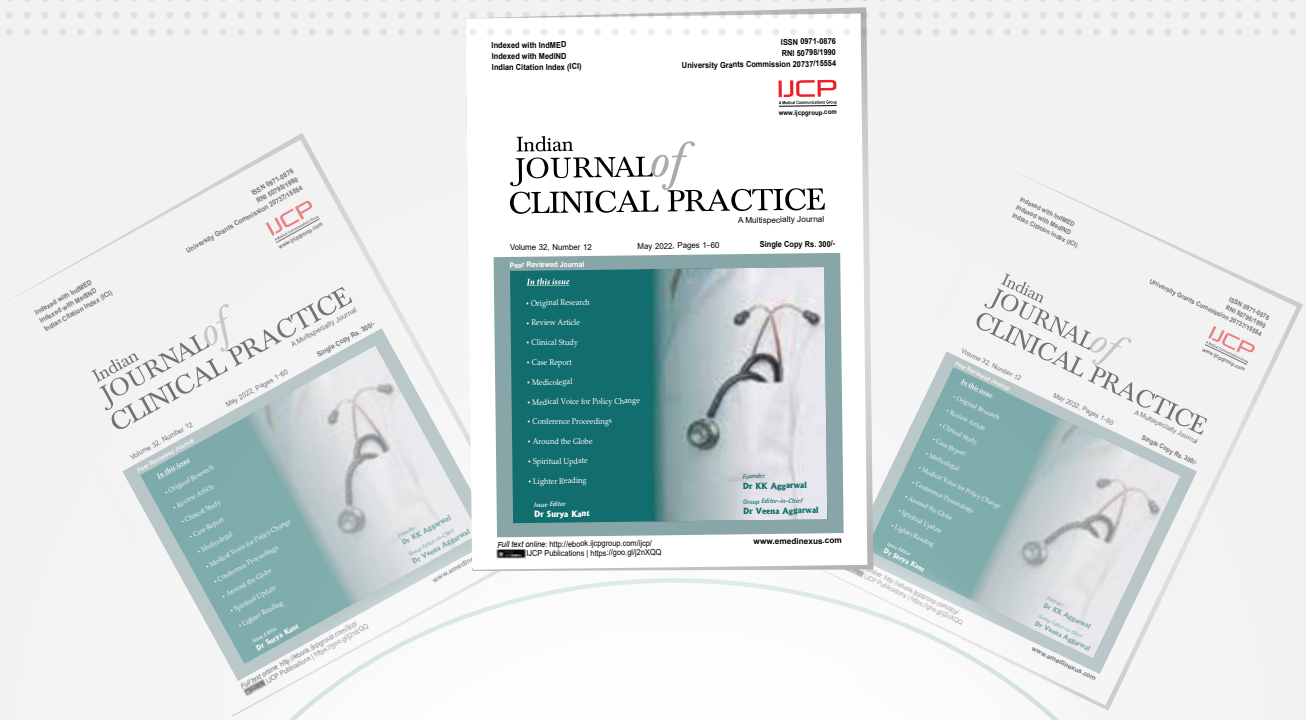

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These should conform to the Vancouver style. References should be numbered in the order in which they appear in the texts and these numbers should be inserted above the lines on each occasion the author is cited (Sinha[12] confirmed other reports[13,14]...). References cited only in tables or in legends to figures should be numbered in the text of the particular table or illustration. Include among the references papers accepted but not yet published; designate the journal and add 'in press' (in parentheses). Information from manuscripts submitted but not yet accepted should be cited in the text as 'unpublished observations' (in parentheses). At the end of the article the full list of references should include the names of all authors if there are fewer than seven or if there are more, the first six followed by et al., the full title of the journal article or book chapters; the title of journals abbreviated according to the style of the Index Medicus and the first and final page numbers of the article or chapter. The authors should check that the references are accurate. If they are not this may result in the rejection of an otherwise adequate contribution.
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Paintal AS. Impulses in vagal afferent fibres from specific pulmonary deflation receptors. The response of those receptors to phenylguanide, potato S-hydroxytryptamine and their role in respiratory and cardiovascular reflexes. Q. J. Expt. Physiol. 1955;40:89-111.

Books

Stansfield AG. Lymph Node Biopsy Interpretation Churchill Livingstone, New York 1985.

Articles in Books

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The journal **ISSN number** is 0971-0876 and the **RNI number** is 50798/1990.

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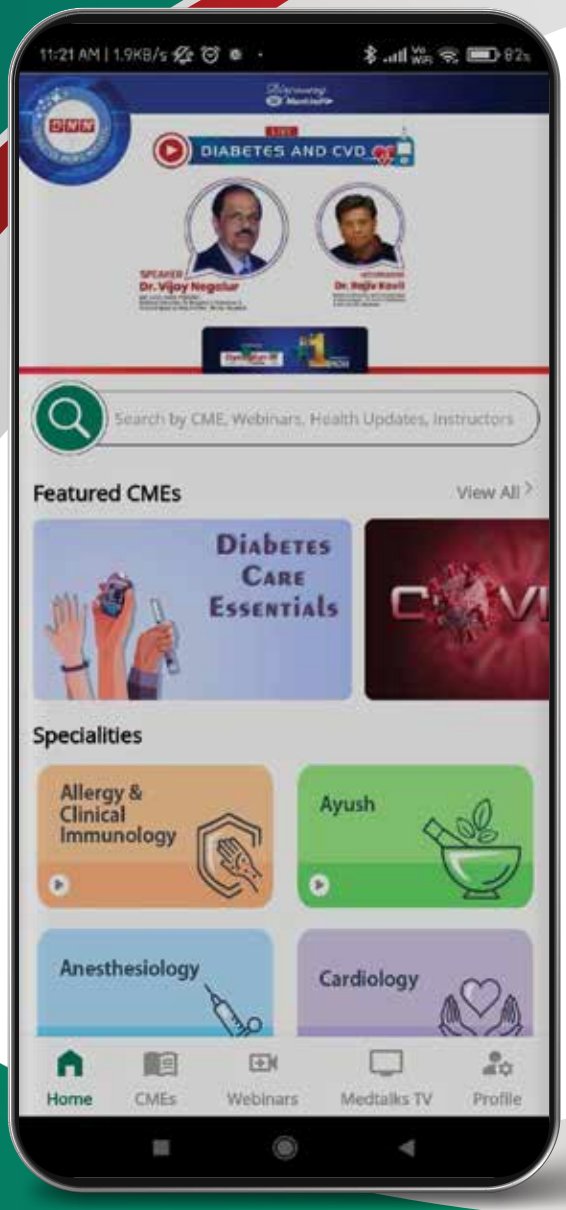

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R.N.I. No. 50798/1990
Date of Publication 13th of Same Month
Date of Posting 13-14 Same Month

POSTAL REGISTRATION NO. DL(S)-01/3200/2021-2023
POSTED AT LPC DELHI RMS DELHI-110006