

Potential Lifestyle Indicators of Health among White-Collar Workers during the SARS-Cov2 Pandemic in India

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Abstract

Lifestyle is well known to be a player in the health of society, increasing the number of concerns on lifestyle diseases accounting to increase in the mortality to the coronavirus pandemic make it more evident. The COVID-19 pandemic is a dreadful disease caused by the recently discovered coronavirus, still at large affecting the lives of millions across the globe. The lockdown and social distancing are known key factors that can slow down the spread apart from host immunity. The objective of this study is to find the effect of many lifestyle components in influencing host immunity and health. **Methods:** COVID lifestyle questionnaire was designed by experts and digitally circulated. The aim of the study is to determine the importance of the various lifestyle components in health, during the Covid 19 pandemic. The questionnaire was related to pandemic lockdown work style, stress, sleep, food habit, physical activity, social connectivity, personal habits, perception of health factors and healthy practices. **Results:** The 94 valid responses in total, and the data showed that the lifestyle component of (i) work duration was high in (n=37, 35.6%), (ii) physical stress at work was high and above in (n=49, 46.6%), mental stress at work (n=65, 61.9%), (iii) sleep -bedtime beyond 11: 00 PM (n=71.68.3%), sleep duration below 6 hours (n=54, 51.4%), (iv) change of food habit (n= 61, 58%), (v) low physical activity (n=42, 40.4%), low exercise (n=56, 53.3%), (vi) social interaction, decrease in peer (n=60, 57.1%), decline in friends (n=55, 52.4%), increase in a family circle (n=64, 61%), increase socializing activities (n= 74, 71.1%). Chi-square

test to determine the association between categorical variables showed an association between Lockdown, Food, Social habits, and personal time with a significance of $p < 0.000$. Perception to boost immunity and health were food, exercise and immunity enhancer intake. Whereas the factors assumed to affect health were food, stress and sleep. **Conclusion:** It is certain that lifestyle components are to be considered in a wholesome approach to health promotion in society to improve overall well-being and potential defense against infections like coronavirus.

Value of the data

- These data provide information on health-related behavior and lifestyle, which is important for understanding the lockdown impact due to COVID-19 on the healthy population.
- The diverse data on various aspects of lifestyle provides key understanding to healthcare teams on priorities to be made based on subject preferences.
- The authorities can benefit from these data to set up adequate protocols for the post-confinement and a possible future similar crisis.
- Other researchers around the world can use these data to conduct comparative studies in other countries.
- These data would be very useful for the marketing teams of the lifestyle variables described so as to enhance their focus.

Objective

COVID-19 as a pandemic had raised many concerns on how certain people or communities have been immune to it completely or with minimum toll. As the saying "survival of the fittest", Lifestyle factors is mostly believed to be the answer to the question that the pandemic has raised. Further, during the pandemic, it was evident that people had modified their lifestyles in the best way possible to keep themselves secure.

Keywords

Lifestyle, Food, Stress, Sleep, Physical activity, Immunity

Imprint

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INTRODUCTION

Lifestyle of most people across the world is strained directly or indirectly due to the recent pandemic COVID-19, an infectious disease caused by the novel coronavirus. ^[1] The Lockdown protocol has varying impacts across different segments of the socio-economic level. At one point or other, the probability of encountering the virus is high and in certain areas may be inevitable in the current unlock phases as more restrictions are lowered and more chances of people coming in close contact with the virus without means of eradicating it. General prevention methods of hand washing, avoiding close contact, social distancing and enhancing immunity are the suggested methods to keep away from coronavirus infection as there are no definite vaccines available yet. ^[2] The host factors against infection such as life stage, lifestyle, co-morbidities and immune status may be the key players of a host being susceptible to contracting the virus. ^[3] The development of the science over a century after the 1918 influenza pandemic has not changed the host factors and external factors influence the virus very much rather developed mutually with a thin line of balance maintained to compensate for the adjustment made between those factors.

Lifestyle is seen to be a common factor in both external and host in determining the severity of the coronavirus. ^[3] Lifestyle is an important factor in health, scientific evidence suggests that it could be governed by many other components like work, physical activity, stress, food habit, sleep habit, perception of health and healthy practice. The aim of the study is to determine the level of significance of the various lifestyle components in the health of the individual.

Job is denoting the role of the person in society today and outlines the lifestyle that may be adopted. Work it is an activity involving mental or physical effort to achieve a purpose and it is said that an individual possesses workability only if the individual has the physical, mental, and social health, standard basic competence and basic occupational virtues of the work. ^[4] If work ability demands health, it also can influence health as an effect on working over a period of time. It is determined that work is an important setting that can influence overall health and well-being. ^[5]

Physical activity is a well-known component in health promotion, well-established physical activity guidelines for varying age groups are found to promise health benefits. ^[6] The coronavirus pandemic has

caused a severe lockdown and may possibly influence the level of physical activity and thereby influencing health.

The stress of multifactorial origin has become a part of modern-day society. Stress is known to place a high demand on the health of the individual to adapt to it, living in complicated and diverse environments. ^[7]

Food being a major source of energy and a potential health indicator, its availability and specificity of the usual food habits may have been modified due to the COVID situation at varying levels. It is well acknowledged that healthy eating impacts well-being and is a measure of disease prevention. ^[8]

Sleep is very vital for physical and mental health; it is having a major link to the overall quality of life. ^[9] Sleep disturbance due to the change in the COVID-19 scenario may be possible and such alteration or insufficient sleep may impact health and lifestyle.

Perception towards health and disease prevention is very crucial to health behavior in the coronavirus pandemic, if the perception is not right or inadequate, difficulty may be experienced in practices and implementation of strategies curbing the virus spread. ^[10]

A healthy practice is generally assumed to be based on knowledge and perception through experience. On the contrary, it is found that superior knowledge of a healthy lifestyle does not relate significantly to healthy practices. ^[11]

The lifestyle components of work style, physical activity, stress, food habit, sleep habit, perception of health and healthy practices are a few of the many other related factors that may affect the overall health status. Determining lifestyle components' significance will facilitate improvising the lifestyle pattern as self-defense against the coronavirus and a better living of the society. The objective of this study is to survey the influence of lifestyle components and their correlation in influencing health.

METHOD AND DESIGN

White collar workers ^[12] in various social groups were listed and an online questionnaire was shared with 784 subjects. A reminder message was sent at intervals of 15 days after the first contact and the responses were closed after a month duration. A total of 105 responded to the online questionnaire, out of which 94 were valid for analysis. The study was placed before the ethics committee and approved as necessary guidelines are followed.

The white-collar respondents were filtered by Job role and gender-wise to further enhance the data on the lifestyle components. Of the total 94 valid respondents, 51 were male and 43 were females, within the age range of 25 – 45 years. Job description-wise, the total samples are classified as 25 teaching professionals, 22 health care professionals, 15 software professionals, and 32 subjects with different backgrounds of desktop workers.

Table 1

COVID lifestyle survey respondents classified by Job

Respondents	Number of responses
Teaching professionals (Lecturers, professors)	25 (26.6%)
Health care professionals (Doctors, Physical therapists, Dentists, Nurses)	22 (23.4%)
Software Professionals (IT)	15 (16%)
Others (desktop workers -Engineers, media, auditors, quality engineers)	32 (34%)
Total	94

The COVID lifestyle questionnaire consists of 24 multiple-choice questions and 2 open-ended questions. The 24 questions were under the heading of Lockdown work, stress, sleep, food, physical activity, social and personal time. The two open end questions asked to prioritize and list three healthy practices and factors that affect health.

RESULTS

The responses are listed below as obtained and analyzed for the potential concerns towards health during the pandemic.

The first part of the survey is directed to the coronavirus pandemic lockdown, it has influenced the workers with very much intensity of 52.4 %. The highest average working hours were reported to be between 4-8 hours at 41%. It is also observed that the mode of work was high among work from home at 60.6%.

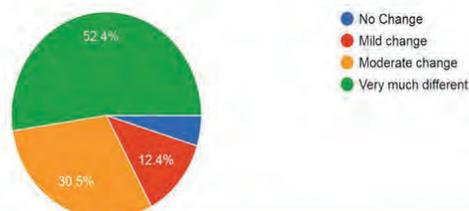
Stress is one of the major components of the modern lifestyle, the level of physical and mental stress perceived due to official and domestic reasons is focused on in this section of the questionnaire. The level of Physical stress at work was highest rated as moderate at 31.4% and mental stress was highest rated as moderate with 44.8%.

The level of physical stress excluding work was surveyed in a similar fashion and was found to be highest among subjects who choose “no” with 33.7%. The mental stress in households was reported highest with, mild in 31.4 %, close to the “no” response by 30.5%

Sleep is one of the major concerns in physical and mental health and it can influence the lifestyle as well, the survey had some key leads towards sleep amidst this pandemic situation like sleep time, and sleep hours before and during a lockdown. The most average time to bed before the lockdown was, before 11: 00 PM by 33.3% respondents. The lockdown impact has seen a change in the most recorded average time to bed after lockdown as, before 12: 00 AM by 34.6% and beyond 12: 00 AM by 33.7% of the respondents. The least average duration of sound sleep as perceived by the respondents was 5 -6 hours by 37.1%, 6-7 hours at 41%.

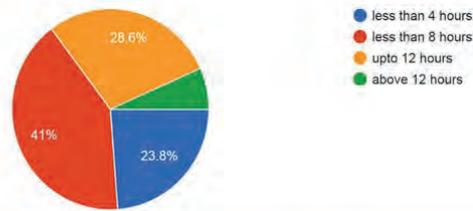
Q1

How intense is the lockdown experience that you fell?
105 responses



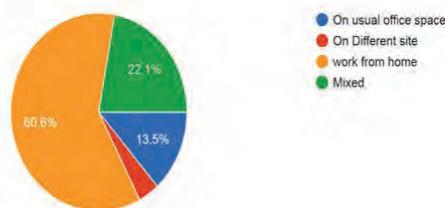
Q2

Average official hours in a day
105 responses



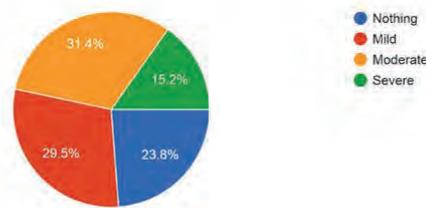
Q3

What is the mode of work during this period? (It may be your office, different locations, work types)
104 responses



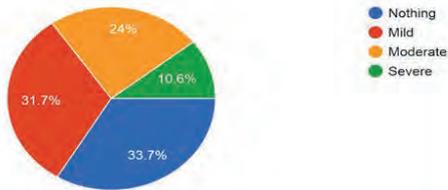
Q4

Level of Physical stress experienced due to official work during lockdown?
105 responses



Q5

Level of Physical stress excluding official work hours ? (home/ stay)
104 responses



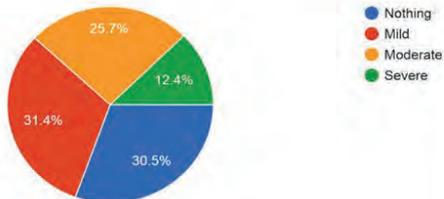
Q6

Level of mental stress at work ?
105 responses



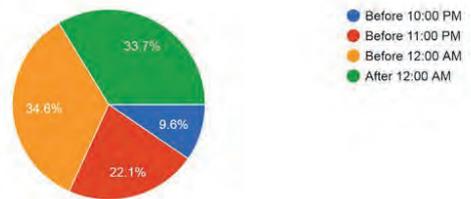
Q7

Level of mental stress excluding official work ? (Home /Stay)
105 responses



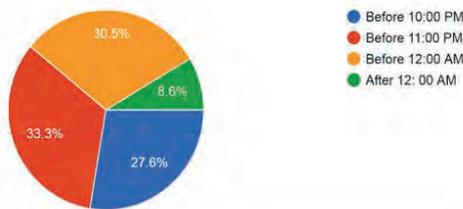
Q8

What is the average time to bed?
104 responses



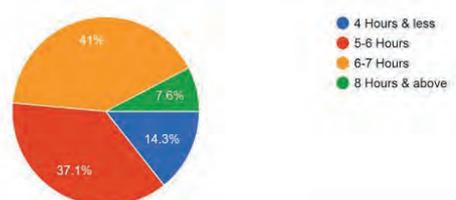
Q9

What is the bed time before lockdown?
105 responses



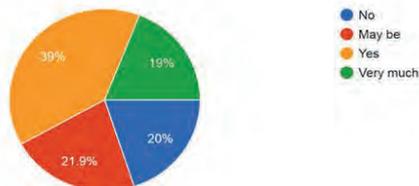
Q10

Average duration of sound sleep? (deep continuous sleep without disturbance)
105 responses



Q11

Is the eating habit changed?
105 responses



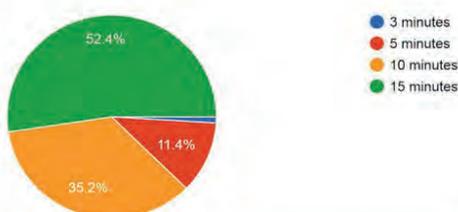
Q12

Is your eating habit healthy now during lockdown?
105 responses



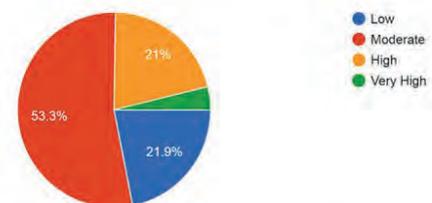
Q13

Average time you spend at meals ?
105 responses



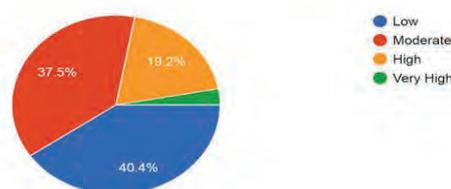
Q14

What level of Physical activity you rate for yourself on your regular lifestyle?
105 responses



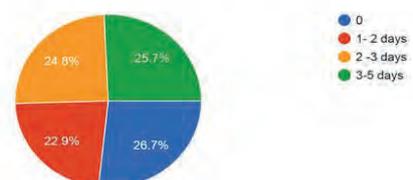
Q15

What level of Physical activity you were able to make up during lockdown?
104 responses



Q16

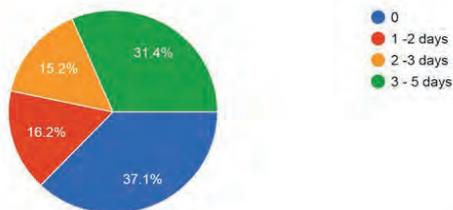
How many days your exercise in a week before lockdown?
105 responses



Q17

How many days your exercise in a week during lockdown?

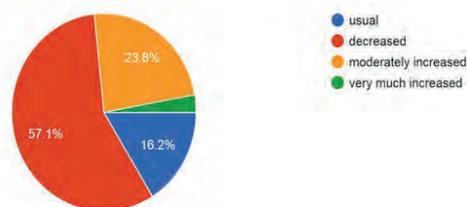
105 responses



Q18

Peer group interaction during lockdown

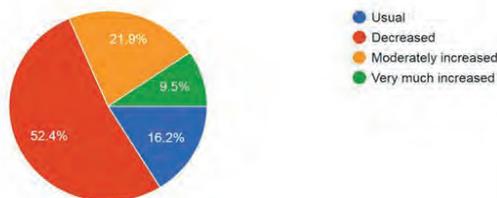
105 responses



Q19

Interaction with friends during lockdown

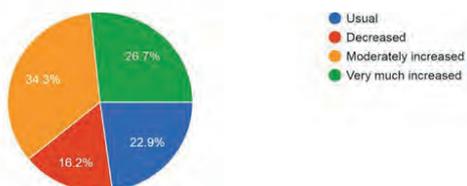
105 responses



Q20

Interaction in family circle during lockdown

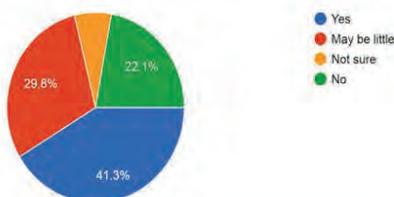
105 responses



Q21

Does any one or many of the social activities like use of gaming (online/board), online app (whatsapp, ticktock, fb, smule), smoking, alcohol, movies have increased during lockdown

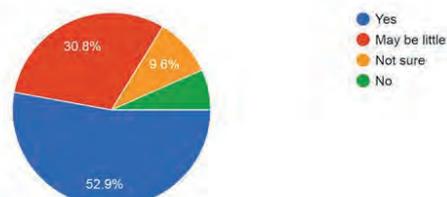
104 responses



Q22

Do you have a personal time for yourself during this lockdown?

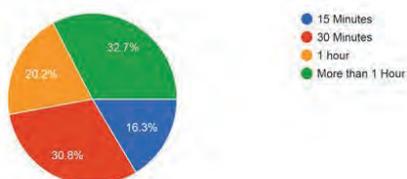
104 responses



Q23

Average personal time in any one or many of things like you like, hobbies / devotion / music/ tv/ walking/ pet care /gardening/ reading / grooming etc.,) in a day?

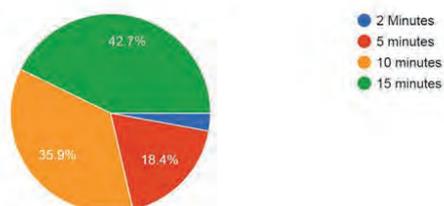
104 responses



Q24

Average time you spend in a bath / grooming?

103 responses



Eating healthy may be a factor in well-being and is also found as a common recommendation for ill health. The lockdown situation existing during the coronavirus pandemic influenced the eating habits surveyed to check whether eating habits has changed and is it healthy enough during the lockdown. Over 19% of the respondents have felt eating habits have changed very much, 39% felt it to have changed certainly. In responses to the question on whether eating habits is healthy during the lockdown, over 41.9% responded a definite yes.

Physical activity is well known to have health benefits. The survey question related to physical activity

level on regular lifestyle recorded the highest response of 53.3% as moderate. The level of physical activity during lockdown was low for 40.4% of respondents. The average number of days of exercise per week was 3-5 days in 26.7% and zero days in 26.7% of respondents before lockdown. During a lockdown, the number of days of the exercise was 3-5 days in 31.4% and zero days in 37.1% of the respondents.

The survey on social components during lockdown assessed Peer group interaction, interaction with friends, interaction with family circle and general socializing habits. The peer group interaction was reported to have decreased in 57.1%. The interaction

with friends has decreased among 52.4%. The interaction with the family circle has remained moderately increased in 34.4%. The general socializing habits have increased in 41.3% respondents. Survey results regarding availability of personal time revealed, yes with 52.9% of respondents.

Out of the two open end questions that asked to enlist three healthy practices and factors that affect health, as per the respondent priority. 85 respondents have suggested varying thoughts as shown in Fig. 1.a. The three major factors considered to affect health by the respondents are shown in Fig. 1.b.

The data analysis for the association between categorical variables with the Chi-square test showed a significance level of $p < 0.000$ with lockdown, food, socialization, social habits and personal time. Mann Whitney U test did not show any significance.

DISCUSSION

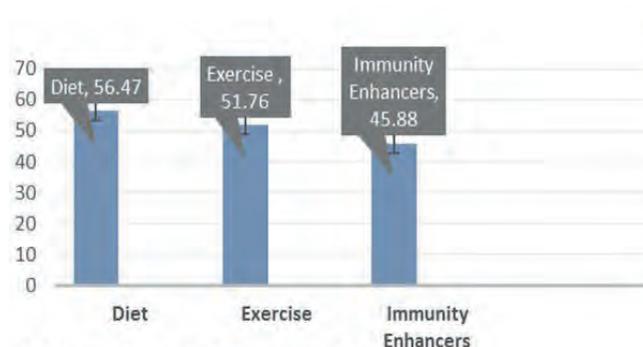
Pandemic is not a new term now looking at the history of mankind, humans have evolved through lot of tough medical emergencies and achieved great milestones towards success. With tremendous growth of science, the management strategies of illness are well advanced, so are the severity and the transmissibility of the disease ever competing. It very much coincides to find a recent study as a prophecy in which it discuss the pandemic preparedness over a century from the last know 1918 pandemic and has stated that we cannot exclude the possibility of similar event, and yet it happened unfortunately at 2019.^[3] The Corona virus pandemic has claimed nearly a million lives and still increasing with no available vaccine as of now. The prevention strategies and symptomatic management is the best suggested available resource against the dreadful disease.^[1]

1918 pandemic control measures included, forceful segregation of infected persons, disinfections,

evacuation, demolition of infected places, detention of any travelers from ships and railways. It was also noted that Prevention and environmental hygiene had long been neglected due to lack of funds.^[13] The Government of India had issued a memorandum on influenza in 1919, that focused on education of the public, to 'keep fit, avoid infection, [follow] healthy living,' and suggested the closure of schools, colleges and cinemas, the wearing of face masks and the use of disinfecting sprays and gargles.^[14] Over the turn of a century, still the control measures and economical gaps towards health accomplishment across the world remains unchanged.

The course of evidence suggests promoting two strategies known as prevention and health promotion to be very effective means in controlling infection. Prevention is aimed to be achieved by avoiding transmission by lockdown and stringent social distancing apart from use of face masks and sanitizers. Health promotion is aimed by improving the host and external factors through various means, and lifestyle remaining the common factor involving health.^[2,3]

It is interesting relief to find that there are a considerable good percentage of recovery rates from the coronavirus infection. It is claimed that many subjects recover from mild to moderate symptoms with supportive care.^[15] In a recent retrospective study involving 116 recovered patients of COVID-19, the criteria to have been recovered and to discharge was (1) throat swab specimens collected 24 hours apart were negative for tests of 2019-nCoV; (2) body temperature was normal for three consecutive days; (3) symptoms of COVID-19 were resolved; (4) the chest computed tomography manifestations of COVID-19 significantly improved.^[16] If there is a recovery with symptomatic management there is a underlying role of unknown factors to regain health.



a) healthy practices to prevent infection



b) Factors that affect health.

Figure 1: Survey report percentage on a) & b)

There are a lot of myths and propaganda among different cultural backgrounds on these underlying factors to prevent or recover from coronavirus infection ranging from use of different spices, alcohol, drugs, methanol, and ethanol. The temperature and climate conditions too are argued as myth in prevention to coronavirus.^[15] However; a recent study has shown that sunlight exposure is associated with recovery from Covid-19.^[17] With such an uncertain thought on the factors that facilitate recovery from COVID 19, host immunity and general health status of the individual seem to be major players in the road to recovery and prevention.

Immunity is a highlighted term on host good health whereby the entire body is on constant surveillance against any invading microorganism threats from environment.^[18] The host immunity is readily available and evolved to control the ill effects of a disease-causing microorganism and when the homeostasis is disturbed the host starts to show symptoms of disease. When the host immunity is compromised pharmacological measures and vaccines facilitate control tolerance mechanism to overcome the infection. This defence strategy relies on the concerted action of innate and adaptive components of the immune system, which sense and target pathogens for containment, destruction or expulsion.^[19]

Coronavirus affects primarily the airway epithelia in the respiratory system, it is believed to have the capacity to overpower the host immunity and produce large pathogen copy numbers.^[20] The few definite link affecting immune responses include that of Angiotensin converting enzyme, CD4⁺ and CD8⁺ T cell. ACE and its products has influence over many organ physiology including immune response^[21], but the role of CD4⁺ and CD8⁺ T Cells are yet to be ascertained and this remains a major research gap to address pathogenesis, vaccine development and control measures of COVID 19.^[22] The faster pace of achieving in-depth knowledge on the transmission, replication of coronavirus and trigger of immune responses will lead to improvement in treatment and prevention strategies for the COVID 19,^[23]

Lifestyle is very much influential in health status, which includes immunity. The survey has incorporated various components of modern day living. The components include work, physical activity, stress, food habit, sleep habit, perception to health and healthy practice. The subjects taken for the study are of white-collar job profiles from urban setups as the

impact of modern day lifestyle can be made much evident and who were employed in a job over 3 years. The white-collar workers include subjects employed in government / private establishments more involved in desktop and human interactions, like software professionals, banking, teachers, health care professionals, traders and other similar services excluding labourers who are considered as blue collar workers.^[12]

The results of the survey had thrown light on various important components of health-related lifestyle components. Job or work is said to be consuming major portion of one's lifetime and it can be a place of gaining or loosing mental and physical health,^[5] nowadays a possible contagious place for coronavirus too. The lockdown due to coronavirus has made the change from the routine and make feel it to be very much intense in around 52.4%. As a result, most of them have reported working from home (60.6%) with an average maximum working time of 4-8 Hours in 41% of the participants and working above 8 hours per day was 35.2%. Working for more hours can be stressful physically and mentally, increasing the risk for many diseases and also in occupational health putting the health ability at risk.^[24] As much of 35.6% of the workers (13.5% of worker continuing job at same location and 22.1% of individuals in shifts) may have increased chances of exposure to coronavirus and makes them more dependent on host immunity.

The level of stress due to work during this pandemic is found to be at a higher level both physically and mentally. High levels of work-related physical stress in 45.6% respondents and mental stress in 35.2% of respondents are noted. The reason may be ranging from reaching targets with skill sets not much used and environmental conditions prevailing due to the pandemic; however the increase in work stress is known to affect physical and mental health by reducing physical activity and increasing depression^[7] The stress related to household reasons have shown an increase level too with 34% experiencing high and above level of physical stress and 38.1% experiencing high mental stress. Stress is known to cause cortisol resistance and altered cell signaling related to immunity.^[25]

Importance of time has overtaken importance to sleep in the modern society lifestyle, with people regarding it as an annoying interference.^[26] The survey revealed that the sleep time has been delayed beyond 12: 00 AM in 33.7% of respondents in contrast to 8.6% of respondents before pandemic lockdown. Moreover,

the sleep hours of less than 7 hours is seen in 92.4% respondents against the average recommended sleep of over 7 hours. Insufficient sleep is considered a modern-day epidemic caused by artificial lighting and modern gadgets,^[9] the pandemic situation had made it much worse. Sleep disruption triggers sympathetic activity and hypothalamic pituitary adrenal axis, increases metabolic activity, disrupts the circadian rhythm, and triggers pro-inflammatory response, becoming a serious concern on host health.^[27]

Eating habit change has been acknowledged by responses of over 58% of the respondents and moreover eating healthy food has become a choice in over 55.2% of the responses. The trend has seen this slope may be because of high proportion of respondents staying home and consuming homemade tailored food. Healthy eating may be associated to infection control and is not positively correlated with stress.^[28]

Physical activity guidelines with respect to age and exercise of minimum 3 days a week is associated with lot of health benefits; the survey reveals reduction in the level of physical activity and exercise days which can be directly attributed to the pandemic situations of the study group. The non-exercise group have accounted to over 50 % of the respondents before and after lockdown is a negative sign towards health in the pandemic situation as engaging in physical activity or exercise is positively related to less stress for many hours of the exercise day^[28]. However, the positive inference on the survey is that the percentage of subjects engaging in exercise for 2-3 days has increased to 5 days in 31% of the respondents.

Social interaction is a main stay of healthy living across all age groups and it plays a constructive role for mental and physical health. Social relationship measured in quality and quantity has short term and long-term effects like, health behavior and mortality risk.^[29] The pandemic situation has revealed a decrease in the peer group interaction by 57.1% and friends by 52.4%, may be a state of concern if the situation prolongs. The interaction with the family circle has increased to 50.5% which may be a source of support or stress; if stressful it is found to compromise immune and endocrine functions^[29]. The existing situation may also have influenced the higher level of socializing habits to 71.1%. The value is projecting increased dependency on electronic gadgets, apps and other habit that may be harmful to health. This is supported by the response of availability of personal time in over 80%.

In the state of infection, the health behavior and practices result more likely to the individual perception towards it, a mismatch in these may be disastrous in health of the society. The three healthy practices to prevent infection are perceived as diet, exercise and consumption of immunity enhancers, considerably very good choices to health and correlate to the responses on food and exercise. The response on preventive measures such as use of masks, sanitizers, social distancing and other healthy practices haven't reached the priority rather, focus is on improving the physical health and immunity as defense to coronavirus. This perception of health among the white-collar group will likely influence the blue-collar group as the trend of living and also significantly affect the participation of the people in the close community and societal decision in coping with the pandemic.^[30]

The white-collar professional's responses to the list of factors that affect health are found to be food, stress and sleep. However, the correlations to responses related to those are found to be positive only with food and negative to stress and sleep. The causes may be multifactorial and being aware on healthy lifestyle does not always turn out to better practice.^[11] In a disturbing fact, It is found that most health care professionals do not engage in a healthy lifestyle and they are less likely to promote it. Healthy lifestyle behaviors are to be adopted and practiced in reality well by the influential group of people among the society as role models, such that the practice is followed by all segments of individuals in the society.

Having considered the various lifestyle components among the white-collar professionals, the components may influence the lifestyle and health of the various levels of the society globally in a similar way or worse. In the prevailing pandemic situation and beyond, the lifestyle components may enhance immunity and life quality. Immunity is found to vary across various life stages and lifestyle of physical activity and nutrition have immune enhancing ability and can reduce the risk of infection. A moderate intensity aerobics have been found to boost immunity and prevent COVID 19 apart from decreasing non communicable disease and improving psychological well being

A lifestyle health model comprising the key factors of work, physical activity, stress, food habits, sleep, perception to health and healthy practices may be focused on all the strategic measures on the health promotion in the society is proposed.



Figure 2: Lifestyle Health model. Image credit: Zeeshan & Sudhan S G (Authors)

Limitation

The questions were more in number hence could have discouraged the participation and caused reduction in the samples and further the study was limited to white collar professionals.

Conclusion

In summary, this survey has highlighted that lifestyle components are to be considered on a wholesome approach to health promotion in the society. It is also well interpreted that the lifestyle components are interdependent and can affect mental and physical health. The causes of imbalance in these health components may be multifactorial and hence intervention strategies at any level of health promotion need to be holistic approach comprising education and practice of these health components, to improve overall wellbeing, immunity and potential defence against infections like coronavirus.

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Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships which have, or could be perceived to have, influenced the work reported in this article.

Ethics statements

Access to the questionnaire was only given if the respondent consented to participate.

Ethical clearance certificate number (KCPT/ETH/2022-004)

Credit author statement

Sudhan S G: Conceptualization, Methodology, Questionnaire preparation, writing Software **Sruthi G:** Data generation, Data curation, Writing **Jyothsna** – Original draft preparation. : Visualization, Investigation **Darshni T:** Software, Validation. : **Zeeshan A:** Writing- Reviewing and Editing. **Vijay Pratap Singh :** Questionnaire review. **Preethi:** Questionnaire review

References:

1. Health topics – Coronavirus [Cited 2020 June 05] [Internet]. Available from: https://www.who.int/health-topics/coronavirus#tab=tab_1.
2. Paital B, Das K, Parida SK. Inter nation social lockdown versus medical care against COVID-19, a mild environmental insight with special reference to India. *Sci Total Environ.* 2020 Apr 23;728:138914.
3. Short KR, Kedzierska K, van de Sandt CE. Back to the Future: Lessons Learned From the 1918 Influenza Pandemic. *Front Cell Infect Microbiol.* 2018 Oct 8; 8:343.
4. Tengland PA. The concept of work ability. *J Occup Rehabil.* 2011;21(2):275-285. doi:10.1007/s10926-010-9269-x
5. Stoewen DL. Wellness at work: Building healthy workplaces. *Can Vet J.* 2016 Nov;57(11):1188-1190.
6. Global Recommendations on Physical Activity for Health. Geneva: World Health Organization; 2010. 4. Recommended Population Levels Of Physical Activity For Health. [Internet]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK305058/> [Cited 2020 June 16].
7. Koo KM, Kim CJ. The effect of the type of physical activity on the perceived stress level in people with activity limitations. *J Exerc Rehabil.* 2018 Jun 30;14(3):361-366.
8. Bisogni, C. A. , Jastran, M. , Seligson, M. , & Thompson, A. (2012). How people interpret healthy eating: Contributions of qualitative research. *Journal of Nutrition Education and Behavior*, 44, 282–301
9. Chattu VK, Manzar MD, Kumary S, Burman D, Spence DW, Pandi-Perumal SR. The Global Problem of Insufficient sleep and its Serious Public Health Implications. *Healthcare (Basel)*, 2018 Dec 20;7(1):1.
10. Lee KS, Feltner FJ, Bailey AL, Lennie TA, Chung ML, Smalls BL, Schuman DL, Moser DK. The relation-

- ship between psychological states and health perception in individuals at risk for cardiovascular disease. *Psychol Res Behav Manag.* 2019 May 7;12:317-324.
11. Sajwani RA, Shoukat S, Raza R, et al. Knowledge and practice of healthy lifestyle and dietary habits in medical and non-medical students of Karachi, Pakistan. *J Pak Med Assoc.* 2009;59(9):650-655
 12. Prihartono NA, Fitriyani F, Riyadina W. Cardiovascular Disease Risk Factors Among Blue and White-collar Workers in Indonesia. *Acta Med Indones.* 2018 Apr;50(2):96-103.
 13. Mushtaq MU. Public health in british India: a brief account of the history of medical services and disease prevention in colonial India. *Indian J Community Med.* 2009 Jan;34(1):6-14. doi: 10.4103/0970-0218.45369. PMID: 19876448; PMCID: PMC2763662.
 14. The Spanish influenza pandemic of 1918-19, News perspectives. Howard Phillips and David Killingray, Taylor & Francis e-Library, 2003. ISBN 0-203-46837-6, ISBN 0-203-77661-5 (Adobe eReader Format), pg.96.
 15. WHO- Coronavirus disease (COVID-19) advice for the public: Myth busters [Internet]. Available from [https://www.who.int/images/default-source/health-topics/coronavirus/eng-mythbusting-ncov-\(80\).png?sfvrsn=afa995ff_2](https://www.who.int/images/default-source/health-topics/coronavirus/eng-mythbusting-ncov-(80).png?sfvrsn=afa995ff_2). [Cited 2020 June 27].
 16. Deng Y, Liu W, Liu K, Fang YY, Shang J, Zhou L, Wang K, Leng F, Wei S, Chen L, Liu HG. Clinical characteristics of fatal and recovered cases of coronavirus disease 2019 in Wuhan, China: a retrospective study. *Chin Med J (Engl).* 2020 Jun 5;133(11):1261-1267. doi: 10.1097/CM9.0000000000000824. PMID: 32209890.
 17. Asyary A, Veruswati M. Sunlight exposure increased Covid-19 recovery rates: A study in the central pandemic area of Indonesia. *Sci Total Environ.* 2020 Aug 10;729:139016. doi: 10.1016/j.scitotenv.2020.139016. Epub 2020 Apr 27. PMID: 32361458; PMCID: PMC7184988.
 18. Nicholson LB. The immune system. *Essays Biochem.* 2016 Oct 31;60(3):275-301. doi: 10.1042/EBC20160017. PMID: 27784777; PMCID: PMC5091071.
 19. Soares MP, Teixeira L, Moita LF. Disease tolerance and immunity in host protection against infection. *Nat Rev Immunol.* 2017 Feb;17(2):83-96. doi: 10.1038/nri.2016.136. Epub 2017 Jan 3. PMID: 28044057.
 20. Felsenstein S, Herbert JA, McNamara PS, Hedrich CM. COVID-19: Immunology and treatment options. *Clin Immunol.* 2020 Apr 27;215:108448. doi: 10.1016/j.clim.2020.108448. Epub ahead of print. PMID: 32353634; PMCID: PMC7185015
 21. Bernstein KE, Ong FS, Blackwell WL, Shah KH, Giani JE, Gonzalez-Villalobos RA, Shen XZ, Fuchs S, Touyz RM. A modern understanding of the traditional and nontraditional biological functions of angiotensin-converting enzyme. *Pharmacol Rev.* 2012 Dec 20;65(1):1-46.
 22. Grifoni A, Weiskopf D, Ramirez SI, Mateus J, Dan JM, Moderbacher CR, Rawlings SA, Sutherland A, Premkumar L, Jadi RS, Marrama D, de Silva AM, Frazier A, Carlin AF, Greenbaum JA, Peters B, Krammer F, Smith DM, Crotty S, Sette A. Targets of T Cell Responses to SARS-CoV-2 Coronavirus in Humans with COVID-19 Disease and Unexposed Individuals. *Cell.* 2020 May 20;S0092-8674(20)30610-3.
 23. Dunning J, Thwaites RS, Openshaw PJM. Seasonal and pandemic influenza: 100 years of progress, still much to learn. *Mucosal Immunol.* 2020 Apr 21:1-8.
 24. Wong K, Chan AHS, Ngan SC. The Effect of Long Working Hours and Overtime on Occupational Health: A Meta-Analysis of Evidence from 1998 to 2018. *Int J Environ Res Public Health.* 2019 Jun 13; 16(12): 2102
 25. Bae YS, Shin EC, Bae YS, Van Eden W. Editorial: Stress and Immunity. *Front Immunol.* 2019 Feb 14;10:245. doi: 10.3389/fimmu.2019.00245. PMID: 30837994; PMCID: PMC6383636.
 26. Worley SL. The Extraordinary Importance of Sleep: The Detrimental Effects of Inadequate Sleep on Health and Public Safety Drive an Explosion of Sleep Research. *P T.* 2018 Dec;43(12):758-763
 27. Medic G, Wille M, Hemels ME. Short- and long-term health consequences of sleep disruption. *Nat Sci Sleep.* 2017 May 19;9:151-161. doi: 10.2147/NSS.S134864. PMID: 28579842; PMCID: PMC5449130.
 28. Schultchen D, Reichenberger J, Mittl T, Weh TRM, Smyth JM, Blechert J, Pollatos O. Bidirectional relationship of stress and affect with physical activity and healthy eating. *Br J Health Psychol.* 2019 May; 24(2): 315-333.
 29. Umberson D, Montez JK. Social relationships and health: a flashpoint for health policy. *J Health Soc Behav.* 2010;51 Suppl(Suppl):S54-66. doi: 10.1177/0022146510383501. PMID: 20943583; PMCID: PMC3150158.
 30. Piatt JA, Van Puymbroeck M, Zahl M, Rosenbluth JP, Wells MS. Examining How the Perception of Health Can Impact Participation and Autonomy Among Adults with Spinal Cord Injury. *Top Spinal Cord Inj Rehabil.* 2016 Summer;22(3):165-172.