Awareness On The Diet Plan In Covid- 19 Among College Students - A Survey

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ABSTRACTCoronavirus disease (COVID-19) is caused by SARS-CoV2 and is a great global public health concern. The zoonotic origin of COVID-19 is likely to be the wet animal market in Wuhan city, China. The transmission of COVID-19 can be from person-to-person and this leads to the isolation of patients. Extensive measures were taken to reduce person-to-person transmission of COVID-19 and to control the current outbreak. So it is necessary and important to know the dietary patterns which play an important role in the prevention of COVID-19. This study involves college students in the age group of 12-40 years. A well structured questionnaire was prepared comprising 15 questions covering socio-demographic information, knowledge , attitude, perceptions was framed and administered to the participants through an online google forms link. A total of 116 responses were collected out of which 42.6% were male and 57.4% were female. 80% of the total population were aware that diet patterns play an important role in COVID-19. Pearson Chi square value= 0.61, p=0.89 (p>0.05 indicating statistically not significant. 73% of the total population were aware that an increase in immunity of our body prevents COVID-19. Pearson Chi square value=5.88, p=0.11 (p>0.05 indicating statistically not significant). It may be concluded that most of the students are aware of the diet pattern in COVID-19. Awareness may be created to have an intake of balanced diet during the pandemic period.

KEYWORDS : Coronavirus, COVID-19, diet, food habits, nutrition.

1. INTRODUCTION

COVID-19 is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2
), previously known as 2019 novel coronavirus (2019-nCoV). It was initially seen in Wuhan China in late December 2019 before spreading globally. On January 30 2020 the WHO declared COVID-19 a global pandemic.(Zhu *e t al.*, 2020)T he symptoms identified in the early stages of COVID-19 outbreak in China are cold, cough, fever, muscle pain and fatigue. As the number of cases increased worldwide doctors increasingly noted gastrointestinal symptoms such as nausea, vomiting, diarrhoea and abdominal pain. Another recent observation particularly among severely ill patients was liver damage.(Rothan and Byrareddy, 2020) SARS- CoV-2 mainly invades alveolar epithelial cells, resulting in respiratory symptoms. Coronavirus is an enveloped and single stranded ribonucleic acid. It is named for its solar corona-like appearance due to the 9- 12 nm long surface spikes.(Zu *e t al.*, 2020) It seems that COVID -19 might be transmitted to humans via bats or pangolin or other wild animals sold at the human food market. Person-to-person transmission occurs via direct contact or through droplets spreading from the coughing or sneezing of the affected individuals. Adverse outcomes and death are more common in elderly people as they have low immunity. The virus easily affects people who have low immunity.(Singhal, 2020) So it is important to boost our immunity as well as have a nutrition diet inorder to prevent COVID-19.

Milk products like yoghurt increases the activity of natural killer cells and reduces the risk of respiratory infections.(Makino *e t al.*, 2010) As we intake increased micro nutrients along with that macronutrients should also be taken because deficiency leads to obesity(García, Long and Rosado, 2009)(Shukri *e t al.*, 2016) which is commonly associated with impaired immune responses, phagocyte functions, cytokine production, cell mediated immunity, secretory antibody response, antibody affinity and thus makes it more susceptible to viral infections.(Thurnham, 1997)(Li *e t al.*, 2020)

Sesame seeds are a good source of several nutrients which are important for the immune system.(Ma *e t al.*, 2019) Quercetin is a flavonoid found in vegetables and fruits also helps in immune system functioning.(Mohan, Veeraraghavan and Jainu, 2015) Fruits and vegetables that supply micronutrients that can boost immune factors. This is because micronutrients like vitamin E, vitamin C and beta carotene are antioxidants. Antioxidants increase the no of T cells subset, increasing natural killer cell activity.(Chandra, 1992) Sweet potatoes, carrots, green leafy vegetables contain beta carotene. Broccoli, strawberries(G *et al.*, 2018), oranges, lemon, mangoes and pineapple(Menon, V and Gayathri, 2016)a re sources of vitamin C. Vegetable oil like Soybean, corn, walnut, sunflower and nuts, seeds, broccoli, spinach are major dietary sources of vitamin E.

Vitamin D deficiency causes the risks of developing chronic diseases such as diabetes mellitus(Ponnulakshmi *e t al.*, 2019), hypertension, cardiovascular disease and cancers (

Jainu, Priya and Mohan, 2018; Wu *e t al.*, 2019)(Rengasamy *e t al.*, 2018; Gan *e t al.*, 2019) and this increases the risk of death from respiratory tract infections.(Muscogiuri *e t al.*, 2017) Vitamin D also protects the respiratory tract and kills the enveloped viruses and reduces the risk of pneumonia. As we are quarantined which leads to less sun exposure it is important to take vitamin D in our diet. Fish(Rengasamy *e t al.*, 2016),liver, egg yolk are required for maintenance of immune function. It has been reported that zinc(Wang *et al.*, 2019) inhibited SARS by inhibiting the template binding and elongation.(te Velthuis *et al* ., 2010)

Foods from poultry, nuts, pumpkin, red meat, sesame seeds, beans, lentils are good sources of zinc. Also oysters contain large amounts of zinc.(Muscogiuri *e t al.*, 2020) Diet has an effect on people's immune system and disease susceptibility.(Valdés-Ramos *e t al.*, 2010) Nutritional deficiency of protein and energy also depresses the immune function and increases the susceptibility to infection. Vitamin A, vitamin B6 and vitamin B12 also play an important role in the maintenance of the immune system.(Gleeson, Nieman and Pedersen, 2004) Avoid deficiency of nutrients that involves immune cell triggering, differentiation and interaction. This helps to maintain an effective immune system.(Naja and Hamadeh, 2020). In particular ginger(Chen *e t al.*, 2019) can be used regularly in diet as it has the ability inhibiting the virus penetration into the lungs tissue and helps to stop the infection. Cardamom can expel excess mucus from the lungs, optimize digestion for assimilation of nutrients, it treats cold, cough, asthma and also helps to eliminate the pathogen from the body through sweat. Garlic protects against the respiratory infections, destroys unwanted bacteria in our body. In addition to all these turmeric, black pepper can also be taken. It is important to note that organic fruits and vegetables have 60% greater nutritional value when compared to non-organic fruits and vegetables. Catharanthus roseus, erect perennial subshrub used in combination with Garcinia Kola seed extract as immunity booster.(Ke *e t al.*, 2019) During this quarantined time, it is important to take care of nutritional habits following a healthy and balanced nutrition pattern that contains high amounts of vitamins, minerals and antioxidants and thereby preventing COVID-19. The aim of this study is to assess the awareness of the diet plan in COVID-19 among college students.

2. MATERIALS AND METHODS

The survey was a prospective descriptive study which was economical, easy to create, wide reach, gathers large data and quick interpretation. The disadvantages are homogeneous population, response bias and survey fatigue. This study is approved by the scientific review board,Saveetha Dental College, Chennai. The sample size is 116 college students. In previous studies, diet behaviours among college students with 190 participants,balanced diet and eating practices among college students with 110 participants, diet and lifestyle among college students with 190 participants were done.(Kim and Kim, 2010) The sampling method is simple random sampling. A self structured questionnaire comprising 15 questions was circulated among the participants through an online survey link. The data was collected and analysed using SPSS software. Comparison between the variables was done using chi

square test. The results were represented in the form of pie charts. Demographic information, COVID-19, diet plan, immunity booster and food habits are the list of output variables to be assessed. The statistical test used descriptive statistics, pie charts and bar diagrams.

3. RESULTS AND DISCUSSION

(Fig 1) 32.17% belong to the age group 12-18 years, 31.30% belong to the age group 18-25 years, 18.26% belong to the age group 25-40 years and 18.26% belong to above 40 years of age. (Fig 2) 41.61% of participants are male and 57.39% of participants are female. (Fig 3) 80% are aware that diet plays an important role in COVID-19 and 20% of participants are not aware that diet plays an important role in COVID-19. (Fig 4) 73.04% of participants are aware that increase in immunity prevents COVID-19 and 26.96% of participants are not aware that increase in immunity prevents COVID-19.

(Fig 5) 80% of participants are aware that cinnamon and black pepper provides immunity against pandemic outbreak. 20% of participants are not aware that cinnamon and black pepper provides immunity against pandemic outbreak. (Fig 6) 83.48% of participants are aware that increases in immunity increases the no of natural killer cells and thereby increases phagocytosis against the virus. 16.52% of participants are not aware of it. (Fig 7) 73.91% of participants are aware that eating nuts increases the immunity of the body whereas 28.09% are not aware of it. (Fig 8) 33.91% of them responded that fruits improve immunity and 47.83% of them have responded that vegetables improve immunity. (Fig 9) 68.46% of participants are aware that herbs boost body immunity and 17.54% of them are not aware of it. (Fig 10) 17.39% of participants have responded that vitamin c rich fruits boosts immunity, 19.13% of them have responded that water content rich fruits juice boosts immunity, 42.61% of them have responded that herbs boosts immunity and 20.87% of them have responded that broccoli boosts immunity. (Fig 11) 78.26% of participants are aware that Tulsi increases the interferon secretions against the virus and 21.74% of them are not aware that Tulsi increases interferon secretions against the virus. (Fig 12) 69.57% of participants knew that an increase in the no of natural killer cells increases immunity whereas 30.43% of them do not know about it. (Fig 13) 69.30% of participants knew eating less salt and sugar improves resistance to COVID-19 whereas 30.70% of them are not aware of it.

We have seen the association (chi square analysis) between age and awareness on the diet pattern in preventing COVID-19 (Fig 14), awareness on increase in immunity of the body (Fig 15), awareness on cinnamon and blackpepper in improving immunity (Fig 16), awareness on increase in the no of natural killer cells against the virus (Fig 17), awareness on eating nuts that increases immunity (Fig 18), awareness on foods that increase immunity at a greater speed (Fig 19), awareness on herbs which boosts immunity (Fig 20), awareness on foods that falls under immunity booster category (Fig 21), awareness on tulasi increasing interferon secretions against virus (Fig 22), awareness on natural killer cells (Fig 23), awareness on eating less salt and sugar in improving resistance to COVID-19 (Fig 24).

Comparing the variabilities between age and awareness on the diet pattern in preventing COVID-19, Pearson chi square value=0.61, p=0.89 indicating statistically not significant. Majority of the age groups are aware of the diet plan in COVID-19 but on analysis there was no statistical significance between different age groups and awareness on diet plan (Fig 14). Majority of all age groups are aware of the immunity of the body but on analysis there was no statistical significance between different age groups and awareness on immunity of the body. Pearson Chi square value= 5.88, p=0.11 indicating statistically not significant (Fig 15). Majority of all age groups are aware of the role of cinnamon and black pepper in improving immunity but in analysis there was no statistical significance between different age groups and awareness on cinnamon and blackpepper in improving immunity against pandemic outbreak. Pearson Chi square value= 3.12, p=0.37 indicating statistically not significant (Fig 16). Majority of all age groups are aware of natural killer cells but in analysis there was no statistical significance between different age groups and awareness on increase in the no of natural killer cells thereby increase in phagocytosis against the virus.

Pearson Chi square value=4.86, p=0.18 indicating statistically not significant (Fig 17). Majority of all age groups are aware of the role of nuts in increasing their immunity but in analysis there was no statistical significance between different age groups and awareness on eating nuts for increasing body immunity. Pearson Chi square value=7.05, p=0.07 indicating statistically not significant (Fig 18). Majority of the people are unaware that fruits boosts immunity at a greater speed compared to vegetables and nuts. Pearson Chi square value=8.09, p=0.23 indicating statistically not significant (Fig 19) Majority of all age groups are aware of herbs in boosting immunity but in analysis there was no statistical significance between different age groups and awareness of herbs in boosting immunity. Pearson Chi square value=1.11, p=0.77 indicating statistically not significant (Fig 20). Majority of the people are not aware that vitamin C rich fruits boosts immunity compared to other foods. Pearson Chi square value=11.46, p=0.24 indicating statistically not significant (Fig 21). Majority of all age groups are aware of the role of tulasi but in analysis there was no statistical significance between different age groups and awareness on tulasi which increases the interferon secretions against the virus. Pearson Chi square value=0.28, p=0.96 indicating statistically not significant (Fig 22). Majority of all age groups are aware of the role of natural killer cells but in analysis there was no statistical significance between different age groups and awareness on natural killer cell numbers. Pearson Chi square value=1.58, p=0.66 indicating statistically not significant (Fig 23). Majority of all age groups are aware of less salt and sugar improving resistance but in analysis there was no statistical significance between different age groups and awareness on eating less salt and sugar. Pearson Chi square value=5.08, p=0.16 indicating statistically not significant (Fig 24).

67.54% of participants are aware of the role of vitamin-D and vitamin-D plays a major role in reducing the severity and illness. Organic foods with good amounts of leafy vegetables and fiber rich foods like legumes, whole grains, beans and vegetables improves the immune system functioning of the body.(Watzl, 2013)(Panarese and Shahini, 2020). Limitations are less no of availability of articles and less facts about COVID-19, increase in sample size and

inclusion of more criteria. Future scope of the study is to have a healthy diet pattern and so we can prevent from getting affected by coronavirus.

4. CONCLUSION

This study concludes that there is awareness of diet patterns in COVID-19 among college students which helps them to have a healthy nutritional diet and also helps in preventing corona virus. Majority of the participants are aware of the diet pattern, role of immunity, cinnamon and blackpepper, natural killer cells, nuts, herbs, tulasi, salt and sugar. Majority of the participants are unaware that fruits and mainly vitamin C containing fruits helps in boosting the immunity compared to other foods. Awareness programs, workshops on the balanced diet, immunity boosting foods may be conducted to lead a holistic life in pandemic condition.

Author Contributions
Helen Reshma : Analysis, Manuscript drafting Vishnu Priya : Analysis, Manuscript drafting
Gayathri : Analysis, Manuscript drafting Kavitha : Analysis, Manuscript drafting

Conflict Of Interest: None

REFERENCES

[1] Chandra, R. K. (1992) ‘Effect of vitamin and trace-element supplementation on immune responses and infection in elderly subjects’, T he Lancet, 340(8828), pp. 1124–1127.

[2] Chen, F. e t al. (2019) ‘6-shogaol, a active constiuents of ginger prevents UVB radiation mediated inflammation and oxidative stress through modulating NrF2 signaling in human epidermal keratinocytes (HaCaT cells)’, J ournal of Photochemistry and Photobiology B: Biology, p. 111518. doi: 1 0.1016/j.jphotobiol.2019.111518.

[3] Gan, H. e t al. (2019) ‘Zingerone induced caspase-dependent apoptosis in MCF-7 cells and prevents 7,12- dimethylbenz(a)anthracene-induced mammary carcinogenesis in experimental rats’, Journal of biochemical and molecular toxicolog y, 33(10), p. e22387.

[4] Gleeson, M., Nieman, D. C. and Pedersen, B. K. (2004) 'Exercise, nutrition and immune function', F ood, Nutrition and Sports Performance II, pp. 186–203. doi: 10.4324/9780203448618-9.

[5] G, R. e t al. (2018) 'CYTOTOXICITY OF STRAWBERRY EXTRACT ON ORAL CANCER CELL LINE', A sian Journal of Pharmaceutical and Clinical Research, p. 353. doi: 10.22159/ajpcr.2018.v11i9.25955.

[6] Jainu, M., Priya, V. and Mohan, S. (2018) 'Biochemical evidence for the antitumor potential of Garcinia mangostana Linn. On diethylnitrosamine-induced hepatic carcinoma', Pharmacognos y Magazine, p. 186. doi: 1 0.4103/pm.pm_213_17.

[7] Ke, Y. e t al. (2019) 'Photosynthesized gold nanoparticles from Catharanthus roseus induces caspase- mediated apoptosis in cervical cancer cells (HeLa)', A rtificial cells, nanomedicine, and biotechnology , 47(1), pp. 1938–1946.

[8] Kim, H.-C. and Kim, M.-R. (2010) 'Analysis on Awareness and Practices for Diet according to Lifestyles of College Students', K orean Journal of Human Ecology, pp. 157–165. doi: 10.5934/kjhe.2010.19.1.157.

[9] Li, Z. e t al. (2020) 'Apoptotic induction and anti-metastatic activity of eugenol encapsulated chitosan nanopolymer on rat glioma C6 cells via alleviating the MMP signaling pathway', Journal of photochemistry and photobiology. B, Biology, 203, p. 111773.

[10] Makino, S. e t al. (2010) 'Reducing the risk of infection in the elderly by dietary intake of yoghurt fermented with Lactobacillus delbrueckii ssp. bulgaricus OLL1073R-1', T he British journal of nutrition, 104(7), pp. 998–1006.

[11] Ma, Y. e t al. (2019) 'Sesame Inhibits Cell Proliferation and Induces Apoptosis through Inhibition of STAT-3 Translocation in Thyroid Cancer Cell Lines (FTC-133)', B iotechnology and Bioprocess Engineering

[12] , pp. 646–652. doi: 10.1007/s12257-019-0151- 1.

[13] Menon, A., V, V. P. and Gayathri, R. (2016) 'PRELIMINARY PHYTOCHEMICAL ANALYSIS AND CYTOTOXICITY POTENTIAL OF PINEAPPLE EXTRACT ON ORAL CANCER CELL LINES', A sian Journal of Pharmaceutical and Clinical Research, p. 140. doi: 10.22159/ajpcr.2016.v9s2.13313.

[14] Mohan, S. K., Veeraraghavan, V. P. and Jainu, M. (2015) 'Effect of pioglitazone, quercetin and hydroxy citric acid on extracellular matrix components in experimentally induced non-alcoholic steatohepatitis', I ranian journal of basic medical sciences, 18(8), pp. 832–836.

[15] Muscogiuri, G. e t al. (2017) 'Vitamin D and chronic diseases: the current state of the art', Archives of toxicology, 91(1), pp. 97–107.

[16] Naja, F. and Hamadeh, R. (2020) 'Nutrition amid the COVID-19 pandemic: a multi-level framework for action', Europea n Journal of Clinical Nutrition. doi: 10.1038/s41430-020-0634-3.

[17] Panarese, A. and Shahini, E. (2020) 'Letter: Covid-19, and vitamin D', Alimentar y Pharmacology & Therapeutics, pp. 993–995. doi: 10.1111 /apt.15752.

[18] Ponnulakshmi, R. e t al. (2019) 'In silico and in vivo analysis to identify the antidiabetic activity of beta sitosterol in adipose tissue of high fat diet and sucrose induced type-2 diabetic experimental rats', T oxicology mechanisms and methods,

29(4), pp. 276–290.

[19] Rengasamy, G. e t al. (2016) ‘Characterization, Partial Purification of Alkaline Protease from Intestinal Waste of Scomberomorus Guttatus and Production of Laundry Detergent with Alkaline Protease Additive’, I

[20] ndian Journal of Pharmaceutical Education and Research, 50(2s). Available at: https://www.ijper.org/article/41 3 (Accessed: 4 June 2020).

[21] Rengasamy, G. e t al. (2018) ‘Cytotoxic and apoptotic potential of Myristica fragrans Houtt.

[22] (mace) extract on human oral epidermal carcinoma KB cell lines’, B razilian Journal of Pharmaceutical Sciences. doi: 10.1590/s2175-9790201800031802 8.

[23] Rothan, H. A. and Byrareddy, S. N. (2020) ‘The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak’, Journal of autoimmunit y, 109, p. 102433.

[24] Shukri, N. M. M. e t al. (2016) ‘Awareness in childhood obesity’, R esearch Journal of Pharmacy and Technology, p. 1658. doi: 1 0.5958/0974-360x.2016.00334.6.

[25] Singhal, T. (2020) ‘A Review of Coronavirus Disease-2019 (COVID-19)’, I ndian journal of pediatrics, 87(4), pp. 281–286.

[26] Thurnham, D. I. (1997) ‘Micronutrients and immune function: some recent developments’, Journal of clinical pathology, 50(11), pp. 887–891.

[27] Valdés-Ramos, R. e t al. (2010) ‘Diet, exercise and gut mucosal immunity’, Proceeding s of the Nutrition Society, pp. 644–650. doi: 1 0.1017/s0029665110002533.

[28] te Velthuis, A. J. W. e t al. (2010) ‘Zn(2+) inhibits coronavirus and arterivirus RNA polymerase activity in vitro and zinc ionophores block the replication of these viruses in cell culture’, P LoS pathogens, 6(11), p. e1001176.

[29] Wang, Y. e t al. (2019) ‘Synthesis of Zinc oxide nanoparticles from Marsdenia tenacissima inhibits the cell proliferation and induces apoptosis in laryngeal cancer cells (Hep-2)’, Journa l of photochemistry and photobiology. B, Biology, 201, p. 111624.

[30] Watzl, B. (2013) ‘Plant foods and inflammatory processes’, Diet , Immunity and Inflammation, pp. 359– 378. doi: 1 0.1533/9780857095749.3.359.

[31] Wu, F. e t al. (2019) ‘Biologically synthesized green gold nanoparticles from Siberian ginseng induce growth-inhibitory effect on melanoma cells (B16)’, Artificia l Cells, Nanomedicine, and Biotechnology, pp. 3297–3305. doi: 10.1080/21691401.2019.164722 4.

[32] Zhu, N. e t al. (2020) ‘A Novel Coronavirus from Patients with Pneumonia in China, 2019’, Th e New England journal of medicine, 382(8), pp. 727–733.

[33] Zu, Z. Y. e t al. (2020) ‘Coronavirus Disease 2019 (COVID-19): A Perspective from China’, Radiology, p. 200490.

[34] García, O. P., Long, K. Z. and Rosado, J. L. (2009) ‘Impact of micronutrient deficiencies on obesity’, N utrition Reviews, pp. 559–572. doi: 1 0.1111/j.1753-4887.2009.00228.x.

[35] Muscogiuri, G. e t al. (2020) ‘Nutritional recommendations for CoVID-19 quarantine’, Europea n journal of clinical nutrition. doi: 10.1038/s41430-020-0635- 2.

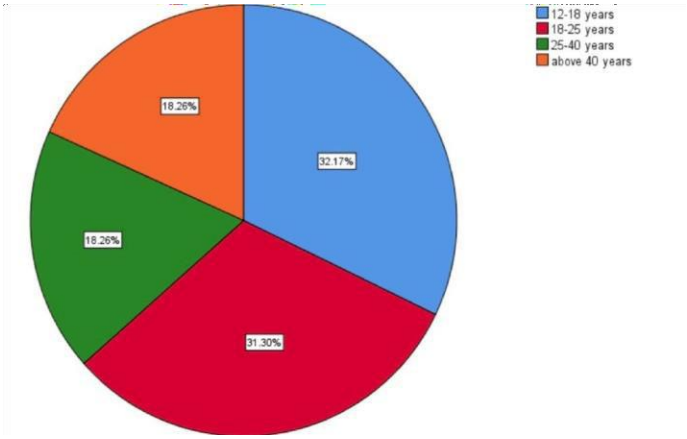


Figure-1: Pie chart showing the percentage distribution of responses on age group of participants. 32.17% belong to the age group 12-18 years (blue color), 31.30% belong to the age group 18-25 years (red color), 18.26% belong to the age group 25-40 years (green color) and 18.26% belong to above 40 years of age (orange color). Majority of the participants were 12-18 years and 18-25 years old.

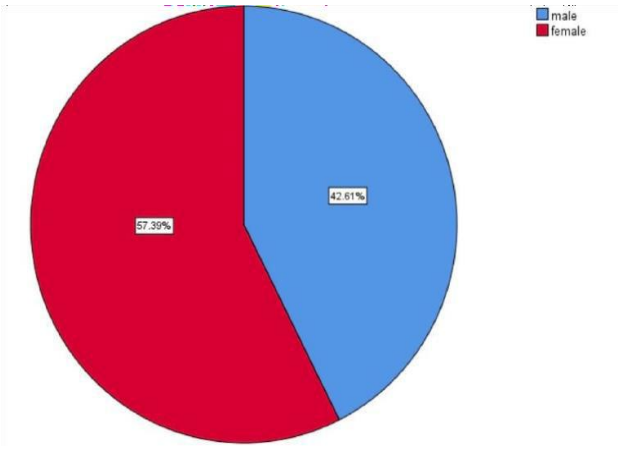


Figure-2: Pie chart showing the percentage distribution of responses on gender of participants. 42.61% were male (blue color) and 57.39% were female (red color). Majority of the participants were females.

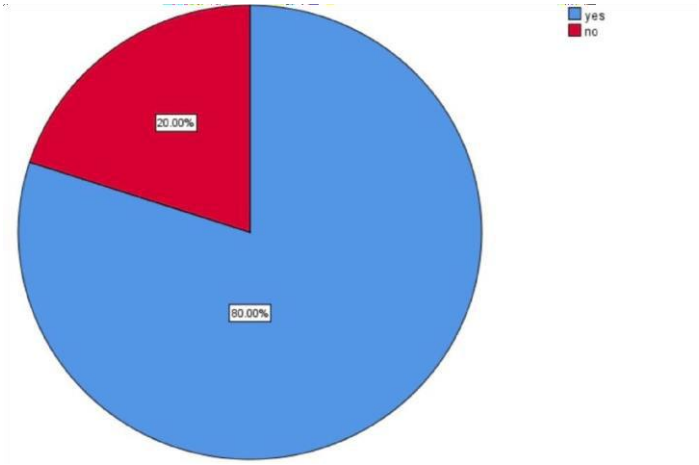


Figure-3: Pie chart showing the percentage distribution of responses on awareness on diet plan in COVID-19. 80% of the participants are aware of the diet pattern (blue color) and 20% of the participants are not aware of the diet pattern (red color). Majority of the participants are aware of the diet plan.

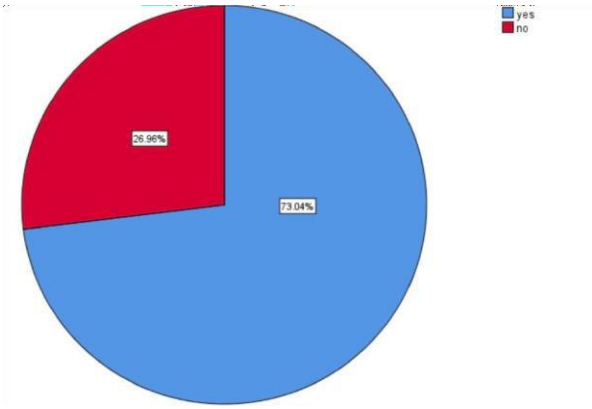


Figure-4: Pie chart showing the percentage distribution of responses on the awareness on the role of immunity in COVID-19. 73.04% of participants are aware of the role of immunity in COVID-19 (blue color) and 26.96% of participants are not aware of the role of immunity in COVID-19 (red color). Majority of the participants are aware of the role of immunity in COVID-19.

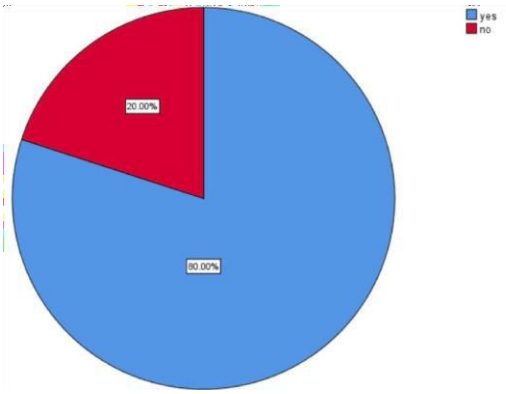


Figure-5: Pie chart showing the percentage distribution of responses on the awareness of the role of cinnamon and blackpepper in preventing COVID-19. 80% of participants are aware

that cinnamon and black pepper provides immunity against pandemic outbreak (blue color). 20% of participants are not aware that cinnamon and black pepper provides immunity against pandemic outbreak (red color). Majority of participants are aware that cinnamon and black pepper provide immunity against pandemic outbreak.

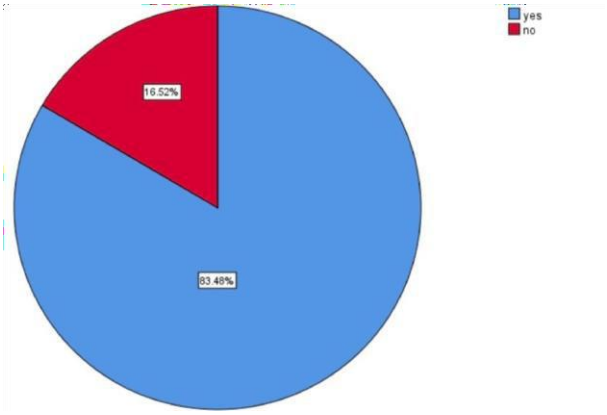


Figure-6: Pie chart showing the percentage distribution of responses on the awareness on role of natural killer cells in immunity. 83.48% of the participants are aware that increase in immunity increases the no of natural killer cells and thereby increases phagocytosis against the virus (blue color) and 16.52% of the participants are not aware of it (red color). Majority of the participants are aware that increase in immunity increases the no of natural killer cells and thereby increases phagocytosis against the virus.

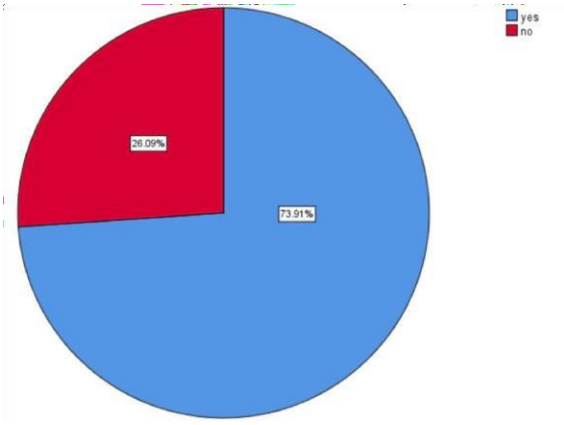


Figure-7: Pie chart showing the percentage distribution of responses on the awareness of the role of nuts in increasing the immunity. 73.91% of the participants are aware that eating nuts increases the immunity of the body (blue color) and 28.09% of the participants are not aware of it (red color). Majority of the participants are aware that eating nuts increases the immunity of the body.

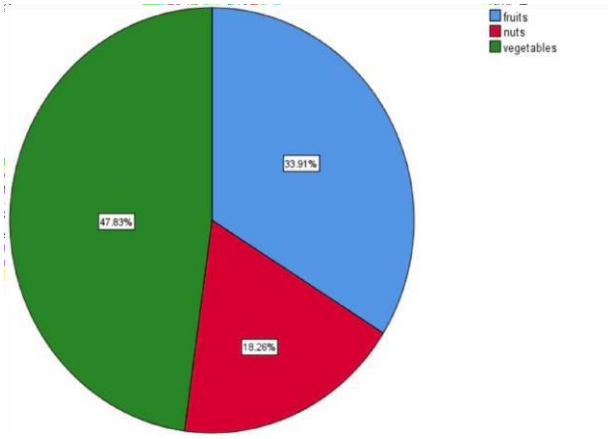


Figure-8: Pie chart showing the percentage distribution of responses on the awareness of foods that increase the immunity against the virus. 33.91% of the participants have responded that fruits improve immunity (blue color), 47.83% of the participants have responded that vegetables improve immunity (green color) and 18.26% of the participants have responded that nuts improve immunity (red color). Majority of the participants have responded that vegetables improve immunity.

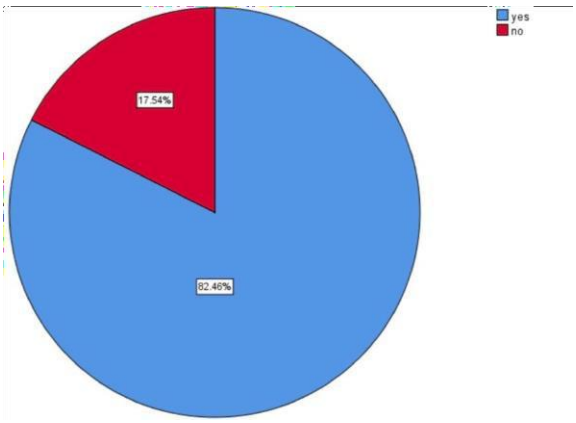


Figure-9: Pie chart showing the percentage distribution of responses on the awareness on ayurvedic foods like herbs in boosting the immunity. 68.46% of the participants are aware that herbs boost body immunity(blue color) and 17.54% of the participants are not aware of it (red color). Majority of the participants are aware that herbs boost body immunity.

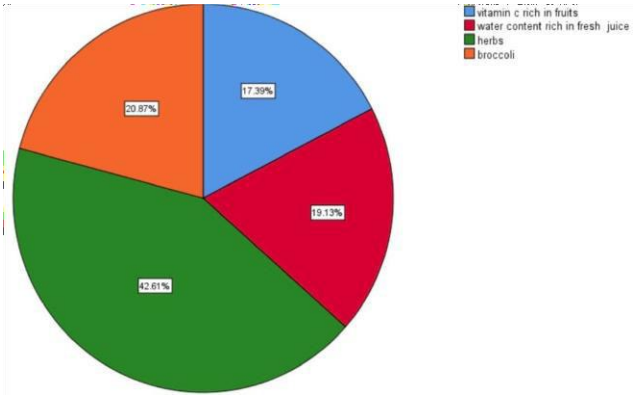


Figure-10: Pie chart showing the percentage distribution of responses on the awareness of foods that play a role in immunity of the body. 17.39% of the participants have responded that vitamin c rich fruits boosts immunity (blue color), 19.13% of the participants have responded that water content rich fruits juice boosts immunity (red color), 42.61% of the

participants have responded that herbs boosts immunity (green color) and 20.87% of the participants have responded that broccoli boosts immunity (orange color). Majority of the participants have responded that herbs boosts immunity.

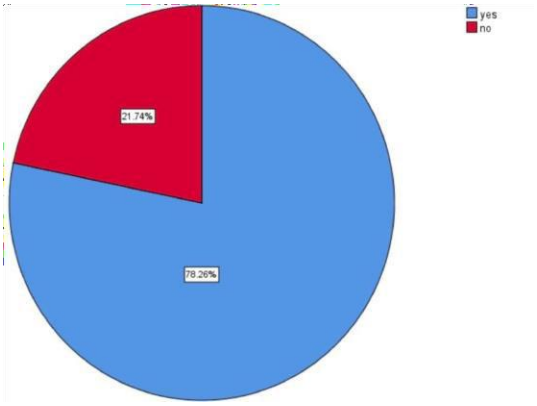


Figure-11: Pie chart showing the percentage distribution of responses on the awareness of the role of tulsi in increasing immunity against the virus. 78.26% of the participants are aware that Tulsi increases the interferon secretions against the virus (blue color) and 21.74% of the participants are not aware that Tulsi increases interferon secretions against the virus (red color). Majority of the participants are aware that Tulsi increases the interferon secretions against the virus.

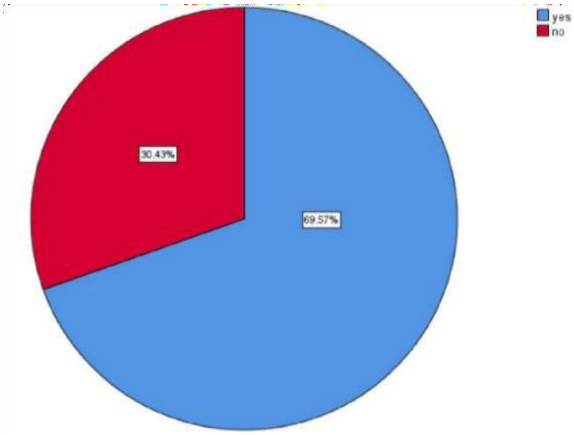


Figure-12: Pie chart showing the percentage distribution of responses on the awareness on natural killer cells in immunity. 69.57% of the participants are aware that an increase in the no of natural killer cells increases immunity (blue color) and 30.43% of the participants are not aware of it (red color). Majority of the participants are aware that an increase in the no of natural killer cells increases immunity.

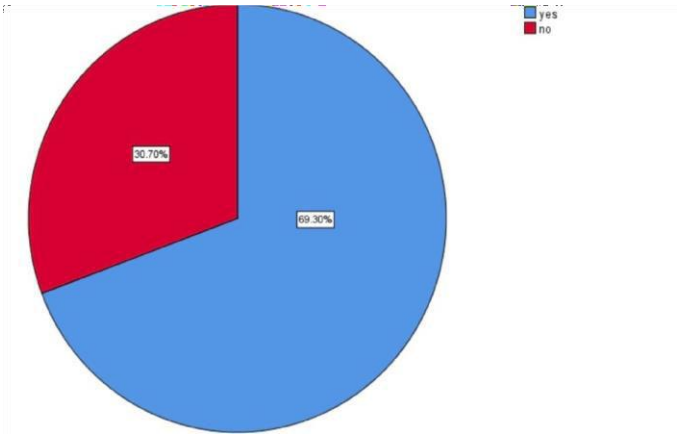


Figure-13: Pie chart showing the percentage distribution of responses on the awareness of the role of salt and sugar in improving the resistance to COVID 19. 69.30% of the participants are aware that eating less salt and sugar improves resistance to COVID-19 (blue color) and 30.70% of the participants are not aware of it (red color). Majority of the participants are aware that eating less salt and sugar improves resistance to COVID-19.

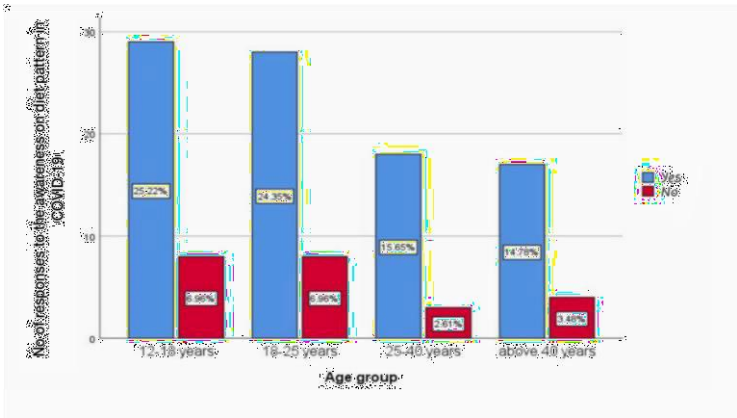


Fig:14 Bar chart showing the association between age group and responses to awareness on the diet plan in COVID-19. X axis represents age of participants and Y axis represents no of responses. 25.22% of the 12-18 years age group reported yes, 24.35% of the 18-25 years age group reported yes, 15.65% of the 25-40 years age group reported yes and 14.79% of the above 40 years age group reported yes. Blue colour denotes yes and red colour denotes no. Majority of all age groups are aware of the diet plan in COVID-19 but in analysis there was no statistical significance between different age groups and awareness on diet plan in COVID-19.

Pearson Chi square value= 0.61, p=0.89 (p>0.05 indicating statistically not significant)

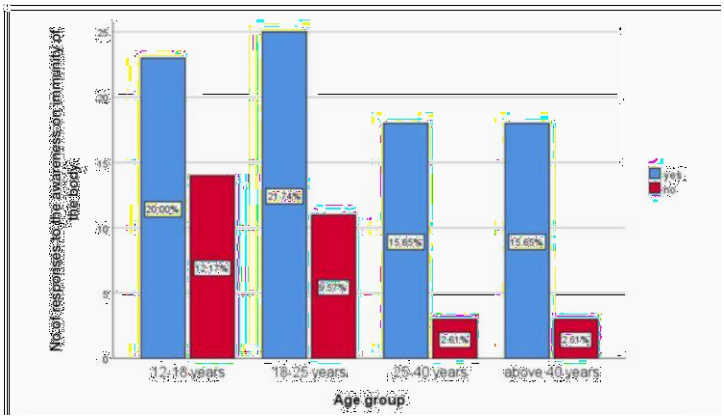
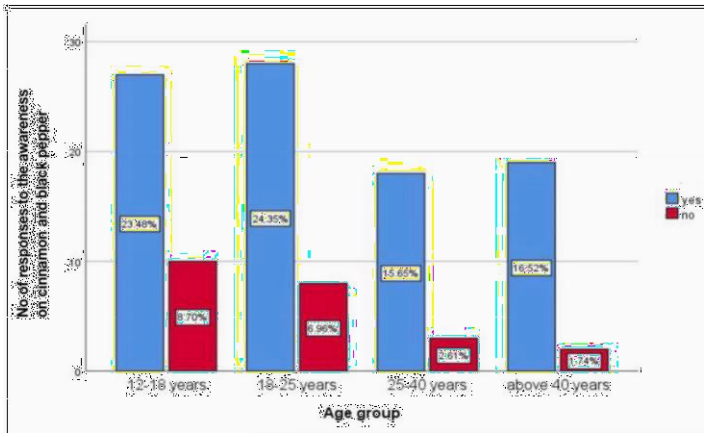


Fig:15 Bar chart showing the association between age group and responses to awareness on the immunity of the body. X axis represents age of participants and Y axis represents no of responses. 20% of the 12-18 years age group reported yes, 21.74% of the 18-25 years age group reported yes, 15.65% of the 25-40 years age group reported yes and 15.65% of the above 40 years age group reported yes. Blue colour denotes yes and red colour denotes no. Majority of all age groups are aware of the immunity of the body but on analysis there was no statistical significance between different age groups and awareness on immunity of the body.

Pearson Chi squ



are value= 5.88, p=0.11 (p>0.05 indicating statistically not significant)

Fig:16 Bar chart showing the association between age group and responses to awareness on cinnamon and blackpepper in improving immunity against pandemic outbreak. X axis represents age of participants and Y axis represents no of responses. 23.48% of the 12-18 years age group reported yes, 24.35% of the 18-25 years age group reported yes, 15.65% of the 25-40 years age group reported yes and 16.52% of the above 40 years age group reported yes. Blue colour denotes yes and red colour denotes no. Majority of all age groups are aware of the role of cinnamon and black pepper in improving immunity but in analysis there was no statistical significance between different age groups and awareness on cinnamon and blackpepper in improving immunity against pandemic outbreak. Pearson Chi square value= 3.12, p=0.37

(p>0.05 indicating statistically not significant).

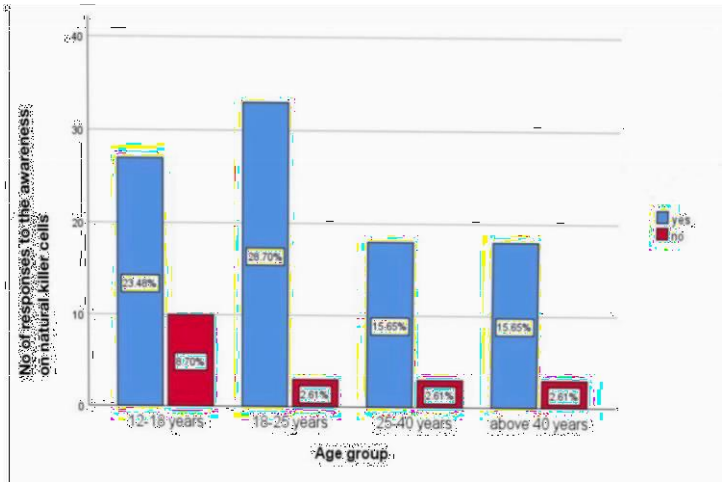


Fig:17 Bar chart showing the association between age group and responses to awareness on increase in the number of natural killer cells thereby increase in phagocytosis against the virus. X axis represents age of participants and Y axis represents no of responses. 23.48% of the 12-18 years age group reported yes, 28.70% of the 18-25 years age group reported yes, 15.65% of the 25-40 years age group reported yes and 15.65% of the above 40 years age group reported yes. Blue colour denotes yes and red colour denotes no. Majority of all age groups are aware of natural killer cells but in analysis there was no statistical significance between different age groups and awareness on increase in the no of natural killer cells thereby increase in phagocytosis against the virus. Pearson Chi square value=4.86, p=0.18

(p>0.05 indicating statistically not significant).

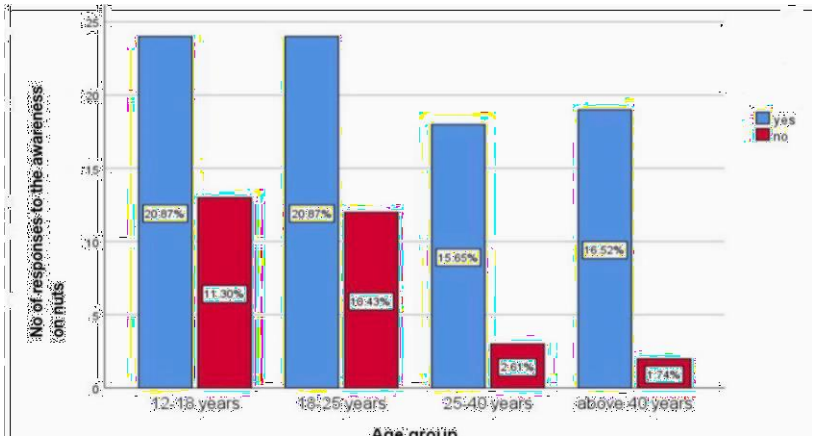


Fig:18 Bar chart showing the association between age group and responses to awareness on eating nuts for increasing body immunity. X axis represents age of participants and Y axis represents no of responses.

20.87% of the 12-18 years age group reported yes, 20.87% of the 18-25 years age group reported yes, 15.65% of the 25-40 years age group reported yes and 16.52% of the above 40 years age group reported yes. Blue colour denotes yes and red colour denotes no. Majority of all age groups are aware of the role of nuts in increasing their immunity but in analysis there was no statistical significance between different age groups and awareness on eating nuts for increasing body immunity. Pearson Chi square value=7.05, p=0.07 (p>0.05 indicating statistically not significant)

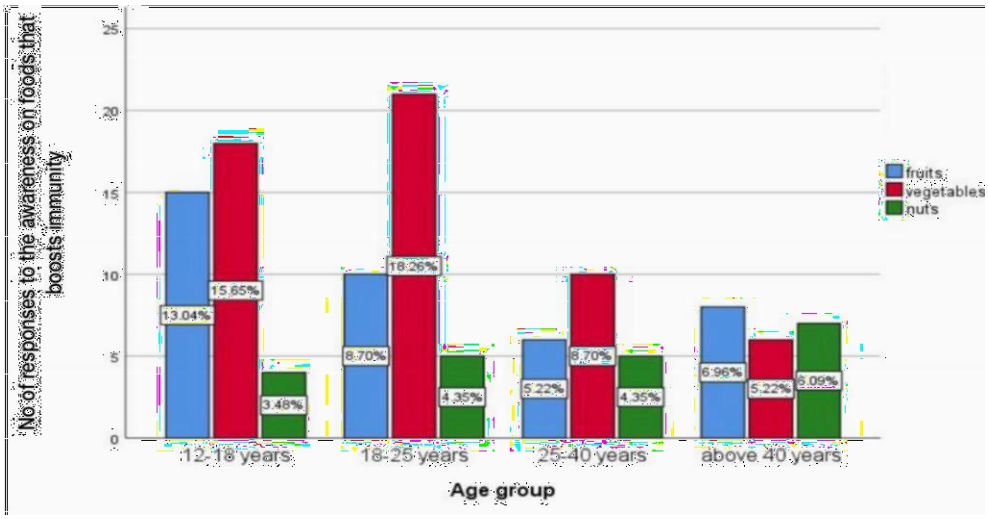


Fig:19 Bar chart showing the association between age group and responses to awareness on foods that increase immunity at a greater speed. X axis represents age of participants and Y axis represents no of responses. 13.04% of 12-18 years people are aware that fruits boosts immunity at a greater speed compared to vegetables and nuts. 8.70% of 18-25 years people are aware that fruits boosts immunity at a greater speed compared to vegetables and nuts. 5.22% of 25-40 years people are aware that fruits boosts immunity at a greater speed compared to vegetables and nuts. 6.96% of above 40 years people are aware that fruits boosts immunity at a greater speed compared to vegetables and nuts. Blue color denotes fruits, red color denotes vegetables and green color denotes nuts. Majority of the people are unaware that fruits boosts immunity at a greater speed compared to vegetables and nuts. Pearson Chi

square value=8.09, p=0.23 (p>0.05 indicating statistically not significant)

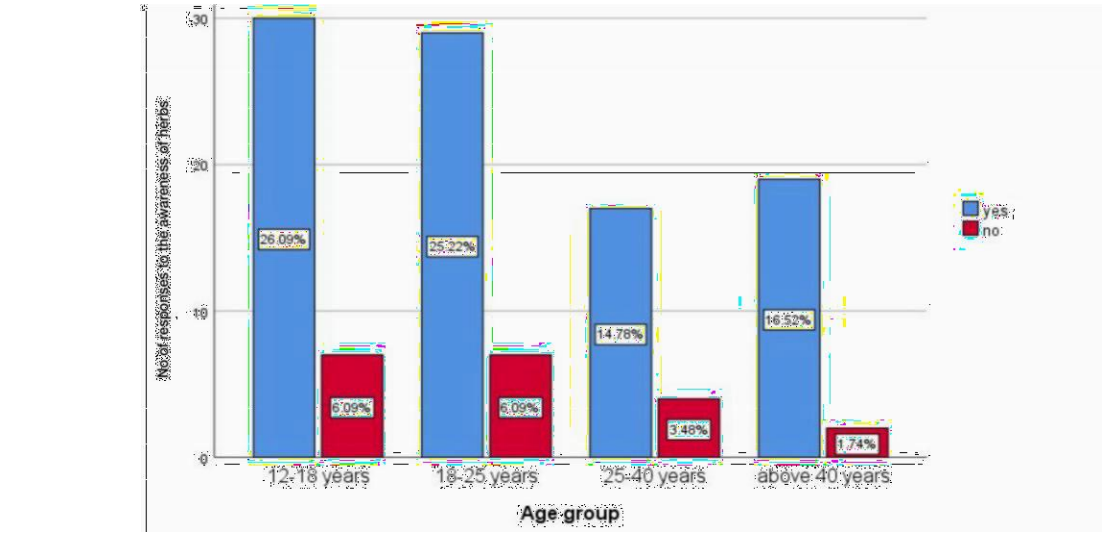


Fig:20 Bar chart showing the association between age group and responses to awareness on herbs in boosting immunity. X axis represents age of participants and Y axis represents no of responses. 26.09% of the 12-18 years age group reported yes, 25.22% of the 18-25 years age group reported yes, 14.78% of the 25-40 years age group reported yes and 16.52% of the above 40 years age group reported yes. Blue colour denotes yes and red colour denotes no. Majority of all age groups are aware of herbs in boosting immunity but in analysis there was no statistical significance between different age groups and awareness of herbs in boosting immunity. Pearson Chi square value=1.11, p=0.77 (p>0.05 indicating statistically not significant).

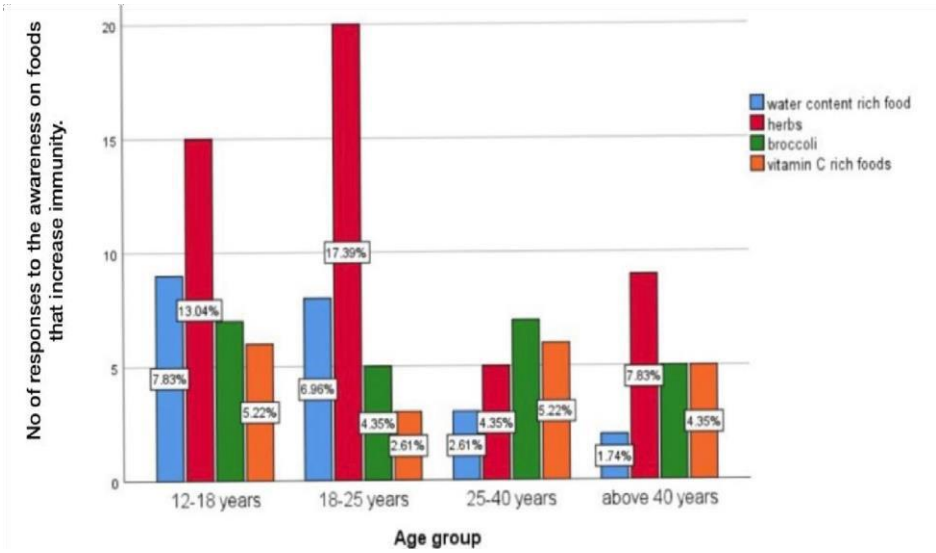


Fig:21 Bar chart showing the association between age group and responses to awareness on foods that fall under the immunity booster category. X axis represents age of participants and Y axis represents no of responses. Majority of the people aged 18-25 years are more aware of foods that increase their immunity than others. However, there is no significant difference statistically found. Pearson Chi square value=11.46, p=0.24 (p>0.05 indicating statistically

not significant)

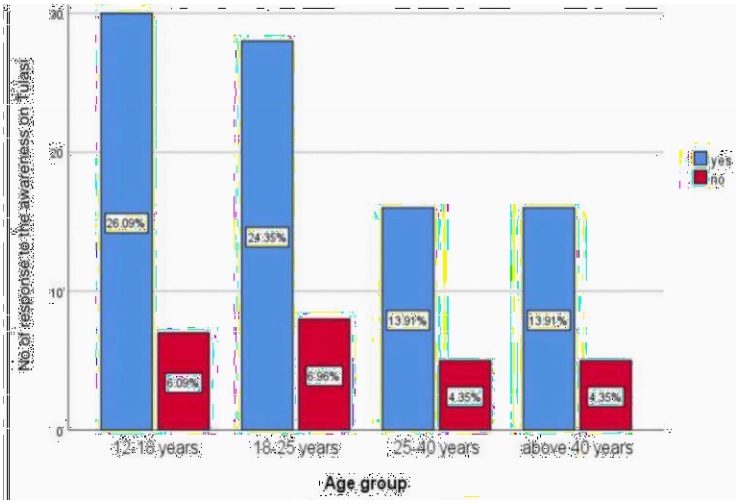


Fig:22 Bar chart showing the association between age group and responses to awareness on tulasi which increases the interferon secretions against the virus. X axis represents age of participants and Y axis represents no of responses. 26.09% of the 12-18 years age group reported yes, 24.35% of the 18-25 years age group reported yes, 13.91% of the 25-40 years age group reported yes and 13.91% of the above 40 years age group reported yes. Blue colour denotes yes and red colour denotes no. Majority of all age groups are aware of the role of tulasi but in analysis there was no statistical significance between different age groups and awareness on tulasi which increases the interferon secretions against the virus. Pearson Chi square value=0.28, p=0.96 (p>0.05 indicating statistically not significant)

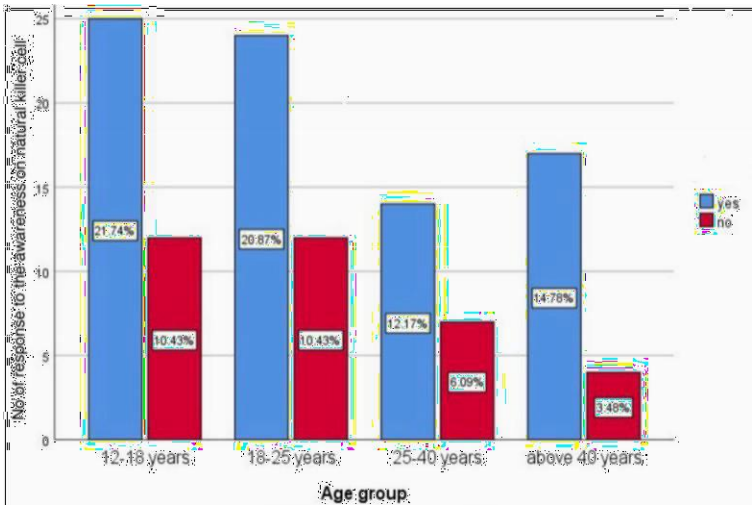


Fig:23 Bar chart showing the association between age group and responses to awareness on natural killer cells no depends on immunity of the body. X axis represents age of participants and Y axis represents no of responses. 21.74% of the 12-18 years age group reported yes, 20.87% of the 18-25 years age group reported yes, 12.17% of the 25-40 years age group reported yes and 14.78% of the above 40 years age group reported yes. Blue colour denotes yes and red colour denotes no. Majority of all age groups are aware of the role of natural killer cells but in analysis there was no statistical significance between different age groups and awareness on natural killer cell numbers. Pearson Chi square value=1.58, p=0.66 (p>0.05

indicating statistically not significant)

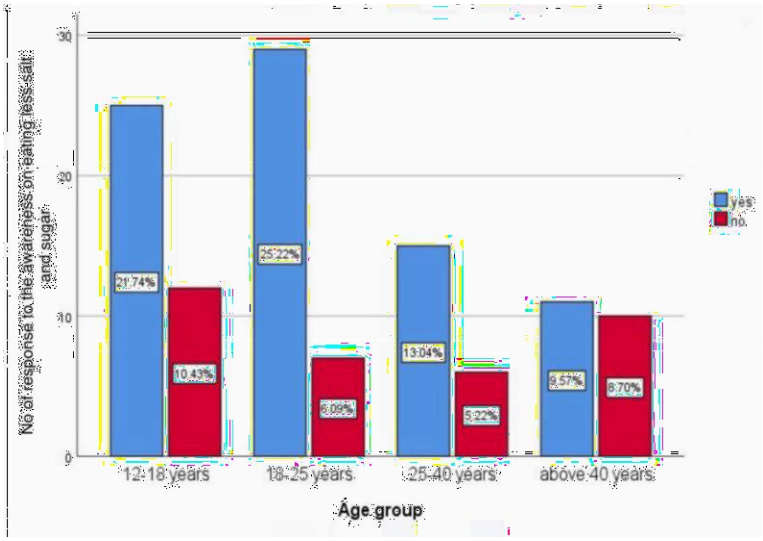


Fig:24 Bar chart showing the association between age groups and responses to awareness on eating less salt and sugar improves resistance to COVID-19. X axis represents age of participants and Y axis represents no of responses. 21.74% of the 12-18 years age group reported yes, 25.27% of the 18-25 years age group reported yes, 13.04% of the 25-40 years age group reported yes and 9.57% of the above 40 years age group reported yes. Blue colour denotes yes and red colour denotes no. Majority of all age groups are aware of less salt and sugar improving resistance but in analysis there was no statistical significance between different age groups and awareness on eating less salt and sugar. Pearson Chi square value=5.08, p=0.16 (P>0.05 indicating statistically not significant).