

Understanding of Various Diet Preferences and Cognizance about Zoonotic Diseases

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ABSTRACT

Diet preferences are dependent on one's culture and habitat and play an indispensable role in the prevention, and management of various health issues. The high prevalence and persistence of food-related diseases are ramifying the human population globally. Although many are preventable through practices of adhering to healthy dietary patterns, and engaging in physical activity. The preponderance of evidence to date suggests that a plant-based diet can be protective and potentially curative for several chronic degenerative diseases and reduces the risk of zoonotic diseases. The present study was designed to analyse various diet preferences and awareness level about their role in the spread of zoonotic diseases amidst covid-19 pandemic.

The present cross-sectional study was conducted online with 757 randomly selected subjects residing in Delhi and NCR of India in the month of May-June, 2020. It was observed that 53.9% of subjects preferred a vegetarian diet. For a very high percentage (88.7%) of the subject's selection criteria for a particular diet, was health quotient. 82.2% of subjects believed that meat consumption increases susceptibility to various infectious diseases including zoonotic diseases. However, only 40.5%, non-vegetarian subjects were willing to adopt a plant-based diet after the Covid-19 outbreak. It was found that majority of vegetarian and non-vegetarian subjects believed that eating animal products lead to spreading of zoonotic diseases.

Keywords: Covid-19, Diet preference, Health, Vegetarian, Non-vegetarian, Zoonotic diseases.

INTRODUCTION

The recent global outbreak of Covid-19 is unprecedented in many ways and the compulsion is that the human population has to stop, sit, and rethink every practice they are involved in to benefit themselves. It includes excessive and unplanned use of natural resources, sedentary lifestyle, consumption of tobacco and alcohol, and illegal trade and mishandling of livestock. All the above activities have led to pollution, climate change, ecosystem disturbance, contamination of food resources, stress, low immunity, and therefore, increased risk of encountering various communicable and non-communicable diseases. [1,2] As reported

Covid-19 is an infectious zoonotic disease, essentially a result of pathogen transmission from non-human animals to humans either by direct contact or by food, water and environment. [3] Earlier also, the world has witnessed the spread of H1N1/Swine Flu (2009), H7N9/Bird Flu (2013), Ebola (2016), Cowpox, and even Mad Cow disease following the similar kind of route. It has been reported that the crowded and filthy conditions of the animal rearing farms serve as a breeding ground for various pathogens and increased risk of antimicrobial resistance. [3] The relationship between non-vegetarian diet and susceptibility to zoonotic diseases is always a matter of concern for general population.

Various reports have indicated that most of diseases encountered by the human population had animal sources and communicated through intake of the same as food. [4-6] However, WHO never stressed on avoiding animal-driven products as food, but it is definitely advised not to eat raw meat or undercooked animal products to avoid cross-contamination with uncooked foods. Management of various chronic diseases, such as cardiovascular disease (CVD), hypertension, cancer, obesity, diabetes, etc. could be attained by a plant-based diet. [7] The health benefits are essentially due to an increased amount of fiber, vitamins C and E, folic acid, non-heme iron, and phytochemicals and less saturated fat, insulin-like growth factor-1, cholesterol, and calories as compared to animal product-based diet. [8] In India, however, diet preferences are primarily driven by faith, culture, or community rather than a healthier lifestyle. Therefore, the aim of the present questionnaire-based study was to assess the awareness about various animal food-borne infectious diseases and possible correlation.

MATERIALS AND METHODS

The present study was conducted from May to June, 2020 with 757 (36.9% male, 63.1% female) randomly selected subjects belonging to different age groups (11-80 years), residing in Delhi and National Capital Region of India. An online google form was designed with 37 close-ended questions divided into 5 sections for obtaining information about the age, educational qualification, occupation, lifestyle, general health, dietary habits, awareness about benefits and drawbacks of different dietary patterns, and impact on health. Furthermore, the awareness level was ascertained about the role of diet on the susceptibility to zoonotic diseases. The questionnaire was disseminated via G-mail and whatsapp. All the participants were assured of confidentiality and individual consent was also taken. Data collected was

compiled and analysed using percentage statistics in Microsoft excel 2016.

RESULTS

Study of basic information of subjects and their diet preferences

Table. 1a & b: Study of sociodemographic information of Subjects and Diet Preferences (Figures in parentheses indicate percentage)

Table. 1(a)		
Parameter	Factor	Number (%)
Gender	Female	478 (63.1)
	Male	279 (36.9)
	Total	n= 757
Locality	Delhi	455 (60.1)
	Gurugram	23 (3.0)
	Faridabad	10 (1.3)
	Ghaziabad	208 (27.5)
	Noida	61 (8.1)
	Total	n= 757
Educational Qualification	Higher Secondary	77 (10.2)
	Senior Secondary	195 (25.8)
	Graduate	288 (38.0)
	Masters	170 (22.5)
	Doctorate	27 (3.6)
	Total	n= 757
Frequency of Routine Health Check-up	Yearly	161 (21.3)
	When advised	529 (69.9)
	Never	67 (8.8)
	Total	n= 757
Present Diet Followed	Vegetarian	408 (53.9)
	Non-vegetarian	343 (45.3)
	Vegan	6 (0.8)
	Total	n= 757
Diet Preference of Females	Vegetarian	296 (61.9)
	Non-vegetarian	182 (38.1)
	Total	n= 478
Diet Preference of Males	Vegetarian	118 (42.3)
	Non-vegetarian	161 (57.7)
	Total	n= 279
If Non-Vegetarian, what is the Frequency of Meat Uptake	Daily	23 (6.7)
	Weekly	177 (51.6)
	Monthly	143 (41.7)
	Total	n= 343

Table. 1(b)				
Parameter	Factor	Vegetarian	Non-vegetarian	Total
Age-group (Years)	11-20	180 (43.5)	189 (55.1)	369 (48.7)
	21-30	107 (25.8)	84 (24.5)	191 (25.2)
	31-40	61 (14.7)	43 (12.5)	104 (13.7)
	41-50	48 (11.6)	21 (6.1)	69 (9.1)
	51-60	14 (3.4)	5 (1.5)	19 (2.5)
	61-70	2 (0.5)	1 (0.3)	2 (0.3)
	71-80	2 (0.5)	0	3 (0.4)
	Total	n= 414	n= 343	n= 757
Occupation	Student	228 (55.1)	230 (67.1)	458 (60.5)
	Home maker	33 (8.0)	13 (3.8)	46 (6.1)
	Service	97 (23.4)	73 (21.3)	170 (22.5)
	Business	13 (3.1)	7 (2.0)	20 (2.6)
	Others	43 (10.4)	20 (5.8)	63 (8.3)
	Total	n= 414	n= 343	n= 757

Out of 757 subjects, 63.1% were female, and the maximum (60.1%) were residents of Delhi. Majority of subjects 69.9% went for their routine health check-up only when they were advised by a medical practitioner. In the present study, 53.9% of subjects are vegetarian and 45.3% are non-vegetarian with respect to their present diet preference. A very low number of subjects (n=6) were vegan. Out of a total 45.3% non-vegetarian subjects, the maxima were having meat weekly (51.6%, n=177), followed by monthly (41.7%, n=143) meat-eaters (Table. 1a). 48.7% (n=369) subjects belonged to age-group eleven to twenty years, followed by age-group twenty-one to thirty years (25.2%, n=191), an assemblage of the young population for the study and thus, maximum (60.5%, n=458) were students (Table. 1b).

Analysis of routine health parameters undertaken by subjects following different diet patterns

Smoking, consumption of tobacco (in any form), and alcohol intake play a major role in the deterioration of health, and in the present study maximum subjects were non-smokers (89.8%), non-tobacco takers (97.4%), and non-alcoholic (77%). Also, 97.5% of subjects were non-diabetic and no major difference was observed with respect to diet preference. Cholesterol level and blood pressure were also in the normal range for more than 65% of the subjects. 25.9% of subjects had never checked their cholesterol level and 16.2% never checked their blood pressure. Hemoglobin level for 48.9% subjects was normal or above normal and a large proportion (40.7%, n=308) of respondents never went for hemoglobin estimation (Figure 1).

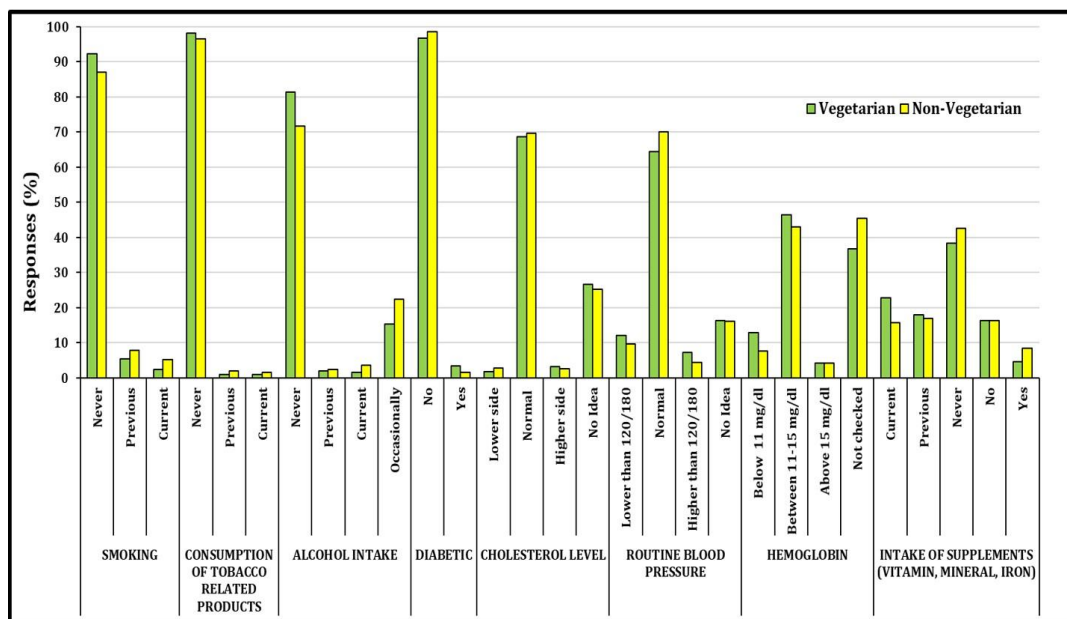


Figure 1. Analysis of Routine Health Parameters Undertaken by Subjects Following Different Diet Pattern

To study various reasons for adhering to a particular diet pattern

Subjects were surveyed about selection criteria for a particular diet they are following presently. Only 11.2% responded that taste was the main reason irrespective of being vegetarian or non-vegetarian. For remaining (88.8%), health quotient of food was an important reason for

adhering to a particular diet pattern. Total 34.5% of subjects from the present study tried to switch their diet in the past, and out of those overall, 52.1% were forced to do so essentially due to health concerns. 13.8% switched due to the fear of encountering an infectious disease. A few 6.5% and 6.1% did for environmental concerns and animal welfare respectively (Table. 2).

Table 2: To Study Reason for Adhering to a Particular Diet Pattern (Figures in parentheses indicate percentage)

Parameter	Factor	Vegetarian	Non-vegetarian	Total
Criteria of Following a Particular Diet	Tasty	34 (8.2)	51 (14.9)	85 (11.2)
	Healthier	70 (16.9)	43 (12.5)	113 (14.9)
	Both	310 (74.9)	249 (72.6)	559 (73.8)
	Total	n= 414	n= 343	n= 757
Parameter				
Factor		Number		(%)
Benefits of Non-Vegetarian Diet Experienced by Subjects Following the Same	Rich in proteins	87 (25.4)		25.4
	Nutritious	18 (5.2)		5.2
	Tasty	33 (9.6)		9.6
	All	168 (49.0)		49.0
	No idea	37 (10.8)		10.8
	Total	n= 343		100
Parameter				
Factor		Vegetarian		Non-vegetarian
Have you tried switching your diet?	Yes	121 (29.2)	140 (40.8)	261 (34.5)
	No	293 (70.8)	203 (59.2)	496 (65.5)
	Total	n= 414	n= 343	n= 757
Earlier Diet Preferences	Vegetarian	0	111 (79.3)	111 (42.5)
	Semi-vegetarian	36 (29.8)	29 (20.7)	65 (24.9)
	Non-vegetarian	84 (69.4)	0	84 (32.2)
	Vegan	1 (0.8)	0	1 (0.4)
	Total	n= 121	n= 140	n= 261
Reasons for Switching to Different Dietary Pattern	Health concerns	41 (33.9)	95 (67.9)	136 (52.1)
	Food preferences	16 (13.2)	31 (22.1)	47 (18.0)
	Protection from infectious diseases	27 (22.3)	9 (6.4)	36 (13.8)
	Environment	14 (11.6)	3 (2.1)	17 (6.5)
	Animal Welfare	16 (13.2)	0	16 (6.1)
	Family (to avoid isolation)	6 (5.0)	2 (1.4)	8 (3.1)
	Budget	1 (0.8)	0	1 (0.4)
	Total	n= 121	n= 140	n= 261

Awareness about health benefits and risks associated with specific dietary pattern

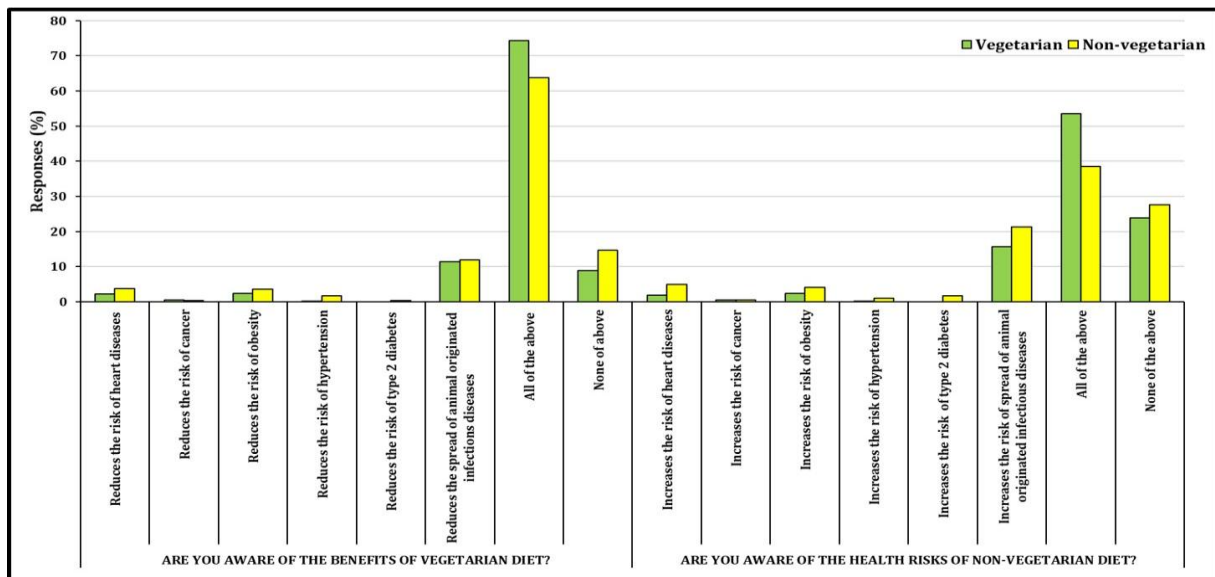


Figure 2. Awareness about Health Benefits and Risks Associated with Specific Dietary Pattern

It was observed that a high percentage of vegetarian (74.4%) and non-vegetarian (63.8%) subjects were aware of all the health benefits of a vegetarian diet. A few were aware about one or the other benefits of following a vegetarian diet, for instance, a lowered risk of heart disease

(2.9%), cancer (0.4%), obesity (2.9%), hypertension (0.9%), diabetes (0.2%), and spread of infectious diseases (11.6%). Only 11.5% subjects were unaware about any of the above-mentioned positive impact of a plant-based diet.

Compared to a high number of vegetarians (55.3%, n=229), a lower number of non-vegetarians (38.5%, n=132) were aware about the health risks of a non-vegetarian diet in terms of various chronic degenerative and animal food-borne infectious diseases. 25.6% of subjects were not aware of the health risks of non-vegetarian diet at all (Figure 2).

Awareness level with respect to the correlation between diet preferences and susceptibility to zoonotic diseases

A high percentage of subjects (62.5%) believed that opting only plant-based diet might impact the food chain.

Almost half (50.3%) of the subjects were conscious about the fact that meat consumption increases the risk of antibiotic resistance both in animals as well as in humans. It was studied that a high percentage (82.2%) of respondents believed that meat consumption increases the probability of spreading zoonotic disease. To support, a total of 73.7% subjects believe following a vegetarian (46.2%) or vegan (27.5%) diet would reduce the predisposition for the same. A very low number (12.2%) of subjects felt that a non-vegetarian diet could reduce the risk of spreading zoonotic diseases (Figure 3).

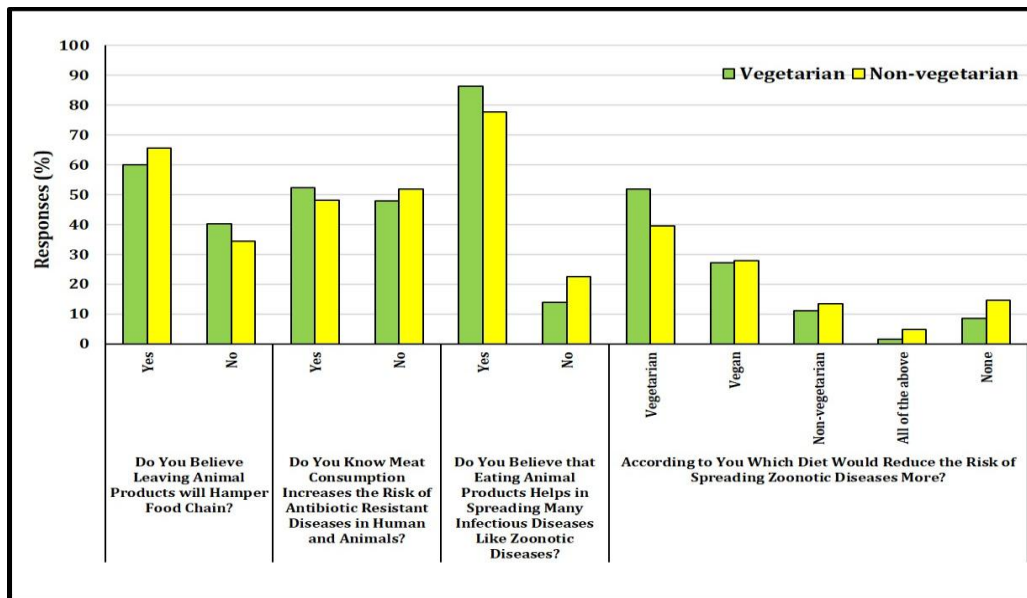


Figure 3. Awareness Level About Impact of Diet Preference on Spread of Zoonotic Disease

Willingness to change diet pattern after Covid-19 pandemic

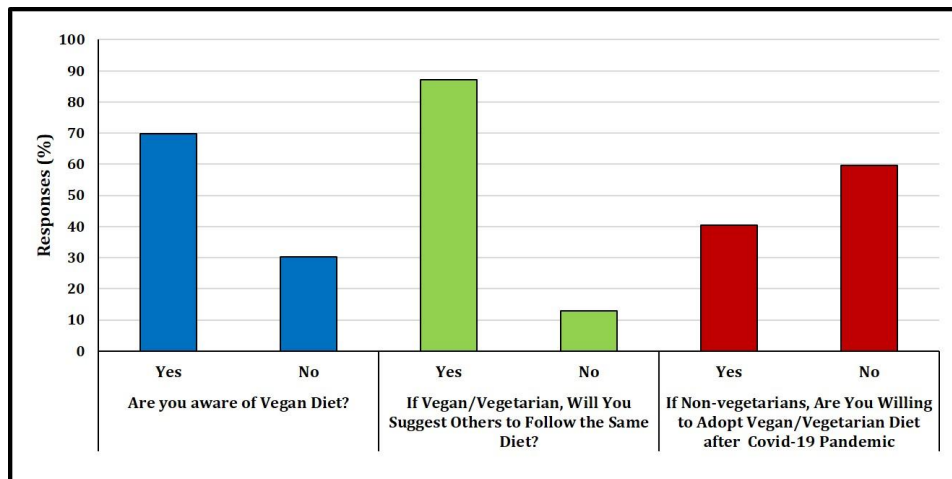


Figure 4. Willingness to Change Diet Pattern After Covid-19 Pandemic

69.7% of subjects from the present survey were aware of the concept of veganism or of a completely plant-based diet. A high percentage (87.2%, n=361) of vegetarian and vegan subjects would recommend the same to others. Although, only 40.5% non-vegetarians were willing to adopt a plant-based diet after Covid-19 outbreak (**Figure 4**).

DISCUSSION

Vegetarianism or veganism is becoming popular not only in India but also all over the world due to health benefits, environmental concerns, and animal welfare. [9] It has been reported that age and gender and culture plays a noteworthy role in deciding one's dietary pattern and females are more inclined towards the intake of fruits, and high fiber food sources. [10,11] Also, in the present study, 61.9% females were vegetarian in comparison to 42.3% males (**Table. 1a**).

The health benefits and risks pertaining to vegetarian and non-vegetarian diet are well documented. [3] However, there is high prevalence of hemoglobin deficiency in vegetarians compared to non-vegetarians because of the non-availability of non-heme iron. The probable cause for same is presence of naturally occurring absorption inhibitors (phytate, oxalate and polyphenols) for non-haem iron in plants. [12] In this concomitant study, it was observed that 12.8% of vegetarian subjects had low hemoglobin content as compared to 7.6% non-vegetarians. Since the present survey majorly belonged to the young population (73.9%), many of them never got their hemoglobin checked (40.7%, **Figure 1**).

Excessive demand of animal-driven food globally has led to the high usage of drugs in livestock rearing farms for increased productivity, which increases the probability for antibiotic resistance. [13] The resistance is transmitted to inhabitant microbes/pathogens and converts them to highly mutable form, having resistance to multiple antibiotics. [14] Besides having such a high risk, 51.9% of non-vegetarian

subjects were unaware of the antibiotic resistance developed by meat consumption (**Figure 3**). This rapid demand of animal-based products also contributing to the acceleration of climate change graph which might furthermore aggravate the susceptibility to zoonotic diseases in respiratory ailment patients. [15] Thus, reducing the consumption of animal-based products also play a pivotal role in diminishing carbon footprints and impact of zoonotic diseases essentially by combating global warming and climate change. [16]

There are inflated discussions on various platforms concerning the role of non-vegetarian diet on the spread of infectious diseases especially after the Covid-19 outbreak. This has led to fright among the general population and 82.2% subjects of the present study believed that meat consumption increases the possibility of the spread of zoonotic diseases (**Figure 4**) and 40.5% of non-vegetarians are ready to adopt vegetarian diet amidst Covid-19 outbreak.

It has been studied that rather than eating meat, the important factor in blowout of zoonotic diseases has been linked to the proximity of animals and humans at slaughterhouses and markets, where there is a high risk of animal-human spillovers of the pathogen. [17] Besides this, habitat loss, biodiversity destruction, ecological upheaval, and thus, the dilution of the complex food chain and globalization lead to increased opportunities for infection. [18,19]

CONCLUSION

Covid-19 pandemic has motivated the subjects to review their diet preferences as majority of vegetarian subjects (87.2%) from the present study are willing to promote plant-based diet and 40.5% non-vegetarian subjects are in favour to adopt the vegetarianism after covid-19 pandemic. They believed that plant-based diet not only averts the risk of antibiotic resistance in livestock but also reduces the aggravation of zoonotic diseases although has no direct role

in prevention of the same. More than 50% subjects were unaware about the role of ecological disturbance in the spread of zoonotic diseases which is again an important factor for the control of such diseases.

In the present survey it was studied that more than 80% of subjects believed that meat consumption lead to increased susceptibility for zoonotic diseases, however, there is no direct evidence to suggest that avoiding non-vegetarian food would lower the risk of a pandemic caused by animal food-borne pathogens. WHO has also suggested to follow guidelines regarding rearing and handling of livestock along with proper cooking of meat that would definitely be beneficial in decreasing the susceptibility to zoonotic diseases. Therefore, it is imperative to generate cognizance about the prerequisite for the inclusion of healthy food and follow safe food practices to avoid spread of zoonotic diseases.

ACKNOWLEDGEMENTS

We are highly thankful to the Principal and Center for Research, Maitreyi College, University of Delhi for constant support and encouragement.

Funding

No external funding was required for this cross-sectional study.

Conflicts of Interest

There are no conflicts of interest among authors. The authors alone are responsible for the content and writing of the paper.

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How to cite this article: Aggarwal A, Gupta R, Rawat S et.al. Understanding of various diet preferences and cognizance about zoonotic diseases. *Int J Health Sci Res*. 2021; 11(4): 255-262. DOI: <https://doi.org/10.52403/ijhsr.20210430>
