



Nutritional Assessment Among Post COVID-19 and Non COVID-19 Elderly Population in Jodhpur, India: A Cross Sectional Study

Sakshi R. Yadav^{*1,2}, Madhu Bala Singh¹, Sumitra Meena², Khushboo Vyas¹, Vipul R. Yadav³, Deepak Sharma⁴ and Ranjeet S. Yadav⁵

¹ICMR-National Institute for Implementation Research on Non-Communicable Diseases, Jodhpur 342 005, India

²College of Community and Applied Sciences, MPUAT, Udaipur 333 001, India

³PDU Medical College, Rajkot 360 001, India

⁴All India Institute of Medical Sciences, Jodhpur 342 005, India

⁵ICAR-Central Arid Zone Research Institute, Jodhpur 342 003, India

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Abstract: A cross-sectional study was carried out in south-west covering areas of Pal, Madhuban, Sangariya primary health centers of Jodhpur city in order to assess the nutritional status of post COVID-19 and non COVID-19 elderly population using the Mini Nutritional Assessment (MNA) techniques. All the subjects were categorized into non-malnutrition (MNA ≥ 24), risk of malnutrition (MNA 17-23.5) and malnutrition (MNA score < 17) groups using MNA score. A total of 200 elderly subjects including 100 each for post COVID-19 and non COVID-19 categories representing 56% male and 44% females were included in the study. Further these elderly subjects were divided into two age groups belong to 60-67 years age (early geriatric) and 68-85 years age (late geriatric). The results revealed that about 61 (67.9% males & 52.3% Females) and 71 (66.1% Males & 77.3% Females) percent belongs to early geriatric group, and 39 (32.1% Males & 47.7% Females) and 29 (33.9% Males & 22.7% Females) percent belongs to late geriatric group in post COVID-19 and non COVID-19 categories, respectively. Religion wise, 95 and 99% subjects were belongs to Hindu in post COVID-19 and non COVID-19 subjects, respectively. About 29 (25% Males & 34% Females) and 12 (19.6% Males & 2.3% Females) percent belongs to general caste, 51 (53.6% Males & 47.7% Females) and 60 (64.3% Males & 54.5% Females) percent belongs to OBC community both in post COVID-19 and non COVID-19 categories, respectively. Rest were belongs to SC and ST in respective category. Overall, the nutritional status of elderly is not satisfactory in both the groups. The percentage of malnutrition observed significantly higher among post COVID-19 (18%) than non COVID-19 (15%) elderly population. Further, males were suffered more than females in terms of malnutrition both in post COVID-19 (35.7%) and non COVID-19 (48.2%) groups. Generally, the prevalence of malnutrition was higher in post COVID-19 subjects. However, higher prevalence of malnutrition (2 to 5%) as well as risk of malnutrition (2 to 20%) was observed in early geriatric than late geriatric group both in post COVID-19 and non COVID-19 categories.

Key words: Nutritional assessment, COVID-19, malnutrition.

In early, December 2019, an outbreak of corona virus disease 2019 (COVID-19), caused by a novel severe acute respiratory syndrome corona virus (SARS-CoV-2) occurred in Wuhan city in China (Li *et al.*, 2020). Later on with the increase in the cases of the contamination as well as increase in mortality WHO declared the SARS-CoV-2 outbreak as a Public Health Emergency of International Concern [PHEIC]. The quick transmission of COVID-19 encompasses the whole world and has all of us in the grips of a deadly pandemic. India also had faced a high

burden of corona virus disease, starting from more deadly alpha then delta and finally the omicron mutants. The new normal like hand washing, wearing facemasks, social distancing, isolation and quarantine etc. aroused during the COVID-19 pandemic significantly impacted the lifestyle behaviour of all the age groups but adversely impacted the most vulnerable and fragile group of geriatric population due to unhealthy eating practices which may also increase the risk of non-communicable diseases. Ageing is a universal phenomenon associated with biological effects as well as significant

*E-mail: sakshiryadav14@gmail.com

Table 1. Distribution of subjects based on gender, age, religion and castes status

	Post COVID-19			Non COVID-19		
	Male (N = 56)	Female (N = 44)	Total (N = 100)	Male (N = 56)	Female (N = 44)	Total (N = 100)
Based on Age group						
60 to 67 Years	38 (67.9)	23 (52.3)	61	37 (66.1)	34 (77.3)	71
67 to 85 Years	18 (32.1)	21 (47.7)	39	19 (33.9)	10 (22.7)	29
Based on religion						
Hindu	54 (96.4)	41 (93.2)	95	55 (98.2)	44 (100)	99
Muslim	00	01 (2.3)	01	01 (1.8)	00	01
Christian	02 (3.6)	02 (4.5)	04	00	00	00
Sikh	00	00	0	00	00	00
Based on caste						
General	14 (25.0)	15 (34.1)	29	13 (23.2)	12 (27.3)	25
OBC	30 (53.6)	21 (47.7)	51	36 (64.3)	24 (54.5)	60
SC	11 (19.6)	07 (15.9)	18	07 (12.5)	08 (18.2)	15
ST	01 (1.8)	1 (2.3)	02	00	00	00

challenges at family system, social security, financial security, psychological, health and rehabilitation etc. Thus elderly face a dual burden, of communicable as well as non-communicable diseases. Though the population is generally susceptible to COVID-19, most of the hospitalized patients were elderly or having chronic diseases (Xu *et al.* 2020; Huang *et al.* 2020). In a recent study of COVID-19 patients, about 52.7% patients were in the malnutrition group and about 27.5% were in risk of malnutrition in China (Li *et al.*, 2020). Therefore geriatric population is most vulnerable group which requires more attention. However, so far very little information is available about the prevalence of malnutrition and related factors in post COVID-19 elderly patients. We carried out the study to scientifically assess the nutritional status of post COVID-19 as well as non COVID-19 elderly subjects in the Jodhpur city in India.

Materials and Methods

The elderly population of Jodhpur city was the subjects of this cross-sectional study. Total 200 geriatric (>60 years age) subjects 100 each for post COVID-19 and non COVID-19 categories including males and female were assessed for nutritional status. In this study, the post COVID-19 subjects with details were collected from the registered list of primary health centre (PHC) Madhuban covering the south-west area of Jodhpur city. From the same area, equal numbers of Non COVID-19 elderly

individuals were selected for examination and data collection. All the selected elderly subjects were interviewed / examined at household level. Each individual was assessed for socio-demographic parameters and mini nutritional assessment (MNA by Guigoz *et al.*, 1996). The ineligible subjects were removed from the study using the criteria of less than 60 years of age, incomplete questionnaire and severe chronic diseases. The distribution and demographic information of Post COVID-19 and Non COVID-19 elderly subjects were presented in the Table 1. The study was conducted according to Indian Council of Medical Research, New Delhi guidelines and was approved by the ethics committee of ICMR- NIIRNCD, Jodhpur, India. The written informed consent was obtained from all the subjects.

Nutritional Assessment

The Mini Nutritional Assessment (MNA) tool was used for assessment of nutritional status in elderly subjects (Guigoz *et al.*, 1996; Guigoz *et al.*, 2002). This was done using 18 items (30 points) including anthropometric (weight, height, arm and calf circumference, and weight loss), general (lifestyle, medication, mobility), dietary (number of meals, food and fluid intake, autonomy of feeding) and subjective (self-perception of health and nutrition) assessments. The assessment was performed with the help of well-trained manpower through one to one interviewing the elderly subjects using well designed questionnaire. The MNA score

categorized the patients in to three categories as well nourished (MNA > 23.5 points), at malnutrition risk (MNA 17 to 23.5 points) and malnourished (MNA <17 points) (Guigoz *et al.*, 1996; Vellas *et al.*, 1999; Agarwal *et al.*, 2013).

Anthropometric measurements were taken for all the subjects individually by door-to-door visit and recorded using standard measurement guidelines (Anonymous, 1995; Anonymous, 2010). The subjects were assessed for body weight (up to decimal kilogram) and height (up to decimal centimetre) and measured in light indoor cloths. It was calculated to be the body mass index (kg m^{-2}). The average of the measures taken on the left and right sides was used to analyse the mid-arm circumference and calf circumference.

Statistical Analysis

Data on socio-demographic aspects, nutritional aspects (MNA) and other data collected were computerized in Microsoft Excel and PAST statistical software (Hammer *et al.*, 2001). Findings have been presented in the form of percentages in tables, graphs and figures. Continuous variables were expressed as mean $\pm$ SD. Categorical variables were expressed as absolute values and percentages. Statistical tests of significance mainly student's t-test, chi-square testes were applied as per feasibility to compare values of variable between groups using PAST statistical software.

Results and Discussion

Distribution of subjects in the study area

Total 200 (100 each) including males (56%) and females (44%) were assessed for post COVID-19 and non COVID-19 subjects. The distribution of these elderly subjects revealed that 61% (67.9% Males & 52.3% Females) and 71% (66.1% Males & 77.3% Females) belong to 60-67 years age whereas 39% (32.1% Males & 47.7% Females) and 29% (33.9% Males & 22.7% Females) belong to 68-85 years and above age group who were post COVID-19 and non COVID-19, respectively (Table 1). Further more than 93% of these subjects belong to Hindu religion followed by Christian (3.6 to 4.5%) and Muslims (1.8 to 2.3%). Further the distribution based on castes revealed that highest magnitude of subjects including both post COVID-19 as well as non COVID-19 belongs to the OBCs

category (47.7 to 64.3%) followed by general (23.2 to 34.1%) then SC (12.5 to 19.6%) and ST (1.8 to 2.3%) categories (Table 1).

COVID-19 caused by SARS- CoV2 appeared in China in December 2019 and spread rapidly worldwide (Li *et al.*, 2020; Guan *et al.*, 2020). The primary illness brought on by the virus was pneumonia, also known as neo-coronavirus pneumonia (Song *et al.*, 2020) which is still non-curable using specific pharmacological treatments (Pang *et al.*, 2020) and leads to malnutrition (Yeo *et al.*, 2019). In general, geriatric individuals has a worse prognosis than middle-age and younger population facing multiple challenges including physical, biological and psychological health disorders, poor family support, social and financial security etc. We have included 200 elderly subjects including both post COVID-19 and non COVID-19 representing 61 & 71% in the age of 60 to 67 years and 39 & 29% in the age of 68 to 85 years. Though the majority of COVID-19 positive subjects were reported mild symptoms (81.1 to 85.7%) followed by moderate (14.3 to 15.9) and only 1 subject was observed for severe symptoms (Table 1).

Nutritional Assessment

The total subjects (200) were comprises of 56% male and 44% female equally in post COVID-19 and non COVID-19 groups. These subjects were assessed as well nourished (85), risk of malnutrition (82) and malnutrition (33) including both post COVID-19 and non COVID-19. Chi square test was applied among males and females within group and between groups among MNA and gender (Table 2). The characterization according to MNA score revealed that 31% (28.6% Males & 34.1% Females) and 13% (14.3% Males & 11.4% Females) percent, 20% (23.2% Males & 15.9% Females) and 18% (12.5% Males & 25.0% Females) and 10% (16.1% Males & 2.3% Females) and 8% (5.4% Males & 11.4% Females) were observed to be well nourished, risk of malnutrition and malnourished in the age group of early geriatric and late geriatric, respectively under post COVID-19 category. Similarly, in non COVID-19 category, 29% (28.6% Males & 29.5% Females) and 12% (16.1% Males & 6.8% Females), 32% (32.1% Males & 31.8% Females) and 12% (16.1% Males & 6.8% Females) and 10% (5.4% Males & 15.9%

Table 2. Percent distribution of elderly subjects under different nutritional groups, MM; Malnourished, RMN; Risk of Malnutrition, WN; Well Nourished

Age Group (years)	Male (N = 56)				Female (N = 44)			Total (N = 100)		
		MN	RMN	WN	MN	RMN	WN	MN	RMN	WN
Post COVID-19										
60 to 67	N	9.0	13.0	16.0	1.0	7.0	15.0	10.0	20.0	31.0
	%	16.1	23.2	28.6	2.3	15.9	34.1	10.0	20.0	31.0
68 to 85	N	3.0	7.0	8.0	5.0	11.0	5.0	8.0	18.0	13.0
	%	5.4	12.5	14.3	11.4	25.0	11.4	8.0	18.0	13.0
Total	N	12.0	20.0	24.0	6.0	18.0	20.0	18.0	38.0	44.0
	%	21.4	35.7	42.9	13.6	40.9	45.4	18.0	38.0	44.0
Non COVID-19										
60 to 67	N	3.0	18.0	16.0	7.0	14.0	13.0	10.0	32.0	29.0
	%	5.4	32.1	28.6	15.9	31.8	29.5	10.0	32.0	29.0
68 to 85	N	1.0	9.0	9.0	4.0	3.0	3.0	5.0	12.0	12.0
	%	1.8	16.1	16.1	9.1	6.8	6.8	5.0	12.0	12.0
Total	N	4.0	27.0	25.0	11.0	17.0	16.0	15.0	44.0	41.0
	%	7.1	48.2	44.6	25.0	38.6	36.4	15.0	44.0	41.0
					Chi² Value			P Value		
Covid-19 Vs Non-Covid-19					13.914			0.0159		
Among Age Group					5.5899			0.3528		
Among Gender					14.407			0.0133		
Among MNA Groups					16.111			0.0972		

Females) and 5% (1.8% Males & 9.1% Females) were observed to be well nourished, risk of malnutrition and malnourished in these age groups, respectively (Table 2). Overall, the percent distribution of elderly population in these nutritional groups was relatively higher in early geriatric population (60 to 68 years) than late geriatric population (68 to 85 years & above) both among post COVID-19 as well as non COVID-19 categories.

Further the gender wise analysis of total subjects revealed that the percent distribution of these subjects were observed in the order of well nourished (42.9% male, 45.4% female) > risk to malnutrition (35.7% males, 40.9% females) > malnourished (21.4% males, 13.6% females) under post COVID-19 category and risk to malnutrition (48.2% males, 38.6% females) > well nourished (44.6% males, 36.4% females) > malnourished (7.1% males, 25.0% females) in case of non COVID-19 subjects (Table 2). The total number of subjects analysed for nutritional status were also follow the same trend and observed as 44, 38 and 18% under post COVID-19 category and 41, 44 and 15% under non COVID-19 category as well nourished, risk of malnutrition and

malnourished subjects, respectively (Table 2). Overall, the percentage of malnutrition observed significantly ($p < 0.05$) higher among post COVID-19 elderly population (18%) than non COVID-19 elderly population.

Mostly malnutrition prevalent in elderly population and impairs the normal body function. Kaiser *et al.* (2010) reported about 23% higher incidence of malnutrition in elderly population. In our study, 15 to 18% subjects were observed malnourished, 38 to 44% were at risk of malnutrition and 41 to 44% were found well nourished. The malnutrition was higher under post COVID-19 (18%) than non COVID-19 (15%) subjects (Table 2). It was proposed that SARS-Cov2 infection and related pneumonia could be closely associated with malnutrition (Wu *et al.*, 2020; Liu *et al.*, 2020). About 52.7% higher prevalence of malnutrition was reported in a cohort of 182 elderly patients with COVID-19 (Li *et al.*, 2020). Further they summarized that the proteins that made muscles was consumed by neo-coronavirus infection, higher co-morbidity in diabetes mellitus, gastrointestinal symptoms and poor appetite might be the probable reasons that exacerbated malnutrition in COVID-19 elderly

patients. Bedock *et al.* (2020) emphasized that significance of nutritional risk screening and the need of early nutritional management in COVID-19 patients. Though we have taken full cognizance for unbiased random sampling but still the study may have certain limitations like single location study, some selective prejudice might be due to monotonous feeding habits for specific religion subjects and also the availability of limited subjects which may restrict the risk variability of the subjects.

Conclusion

The results suggest that Mini Nutritional Assessment is a useful tool in the identification and comparison of nutritional status in the elderly geriatric population. Further, we come to the conclusion that although there was no statistically significant difference between the nutritional condition of the two groups of elderly people in Jodhpur City, but still malnutrition was found to be 3% more in the post-COVID-19 than non-COVID-19 geriatric population group. Therefore, further clinical studies may be undertaken for better understanding of nutritional concern of most vulnerable and fragile geriatric population in the era of COVID-19 pandemic.

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