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Nutritional status & assessment of osteoarthritis among selected geriatric patients in Dhaka City

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Abstract

Background: Osteoarthritis (OA) affects the knees, hips, hands, big toe, and spine. A whole-joint condition, Pain, discomfort, and a lower quality of life can result from cartilage breakdown and inflammation. Malnutrition or poor diet is associated with osteoarthritis.
Objective: To assess Osteoarthritis and its Association with Nutrition among Geriatric Patients in Dhaka City.
Methods: Background: Osteoarthritis (OA) affects the knees, hips, hands, big toe, and spine. A whole-joint condition, Pain, discomfort, and a lower quality of life can result from cartilage breakdown and inflammation. Malnutrition or poor diet is associated with osteoarthritis.
Objective: To assess Nutritional status and osteoarthritis among Geriatric Patients in Dhaka City.
Methods: The study was conducted at Comfort Hospital and NITOR Bangladesh. The period of trial was started from January 2020 to December 2021. The study involved senior osteoarthritis patients from NITOR and COMFORT Hospitals. Data was collected through a semi-structured questionnaire. Socio demographic condition of the geriatric population was measured through standard questionnaire. Standard methods to measures pain, stiffness, difficulties namely WOMAC and to assess nutritional status MNA method was used.
Results: Among 192 respondents, 55.2% respondents belong to 60-69 years. Mean age 74.50±14.40. 58.85% of the respondents were female and 41.15% were male. Total 53.1% patients suffering from osteoarthritis were diagnosis with normal nutritional status (24-30) but 46.9% patients were at risk of malnutrition (17-23.5). These results indicate that a large number of osteoarthritis patients are at risk of malnutrition (46.9%).
The association among pain, stiffness and difficulties was significantly associated with nutritional status of the geriatric population suffering from osteoarthritis. Regarding food frequency score, 76.5% of the population had high acceptable consumption, 19.7% had low acceptable consumption level and only 3.6% had border line consumption level. Significant relationship found between FCS with osteoarthritis ($p>0.001$).
Conclusion: Considering gender it observed that osteoarthritis is more common in older women. According to profession, it was found that high numbers of respondents were housewives. This study explores the age, gender, socioeconomic condition of the elderly population who are suffering from osteoarthritis. Osteoarthritis is a severe public health problem of the elderly population. Need to increase awareness, proper treatment and management, proper diet, modified life style to control OA and malnutrition. Increase awareness, therapy, and management, diet, and lifestyle changes to control OA.

Keywords: Osteoarthritis, Malnutrition, Geriatric Patients.

I. Introduction

The number of older adults worldwide (defined as those over the age of 60) is expected to double by 2050, from 841 million in 2013 to 2 billion, or 21% of the world's population. The senior population is also living longer; by 2050, there will be 392 million more people over the age of 80 than there were in 2013 [1]. Global challenges brought on by this demographic shift include those in public health, politics, labor, and the economy. For the first time ever, older individuals will outnumber children, and the majority of this population growth will take place in underdeveloped nations [2]. because demographic and epidemiological changes occur more quickly in developing nations. Chronic disorders such respiratory illness, arthritis, stroke, depression, and dementia are more common in older people and are associated with aging [3,4]. The most prevalent degenerative joint disease in older people, osteoarthritis (OA) is also one of the leading causes of morbidity, functional limitations, and musculoskeletal disorders [5]. Pain, stiffness, mobility restriction, and loss of function are the most typical symptoms [6]. These diseases may impair swallowing, functional ability, or

appetite, all of which can change how much food is consumed and decrease nutritional status [3,4]. Reduction in muscle mass and buildup of belly fat are two further alterations in senior people's body composition that have been linked to non-transmissible chronic diseases and significant effects on these people's nutritional condition [7].

More than 10% of people worldwide suffer from osteoarthritis. Severe joint discomfort affects patients' ability to move around as it worsens [8]. According to estimates, this illness is the fourth most common reason for disability. The involvement of the hips or knees is responsible for the majority of this impairment burden. Osteoarthritis is closely linked to getting older, and Asia is aging quickly. Furthermore, osteoarthritis has been linked to physically demanding jobs, which are common for those living in rural areas of developing nations. On the other hand, obesity, a significant risk factor, might be less common, although being on the rise. Numerous recent studies [9, 10] compared urban and rural areas as well as impoverished and wealthy populations. Histological or radiographic criteria for osteoarthritis are present, although by the age of 80, only half of those affected show symptoms [11,12]. Pathologically, radiographically, or clinically are three ways to define OA12. By 2030, it is anticipated that OA, which is predominantly brought on by aging, would be the leading cause of impairment in the general population [13]. Millions of people in the United States suffer from osteoarthritis (OA), the most prevalent kind of arthritis [14–16]. The EULAR recommendations emphasize that knee osteoarthritis may be linked to osteoarthritis at other joints because of similar genetic and constitutional risk factors. They also emphasize that the definition of knee osteoarthritis may change depending on the different levels of care required and the clinical requirements [17].

A categorization system created in 1957 by Kellgren and Lawrence categorizes osteoarthritis into five grades: 0-None, 1-Doubtful, 2-Minimal, 3-Moderate, and 4-Severe Grade[18]. Pain is a common clinical sign, especially after heavy lifting and continuous exertion, whereas stiffness is seen after inactivity. It is most likely not a single illness, but the culmination of a number of illnesses that cause joint dysfunction. Degenerative arthritis is another name for it, and it frequently affects the hands, foot, spine, and big weight-bearing joints like the hips and knees [19,20]. According to WHO-ILAR COPCORD studies, 7.5 percent of different rheumatic disorders are prevalent in Bangladesh [21]. The mainstay of OA treatments, according to the Osteoarthritis Research Society International (OARSI) and the American Academy of Orthopaedic Surgeons (AAOS), consists of physical therapy, medication, and surgery. A straightforward, regular supplemental therapy is physical therapy. Weight loss can minimize the mechanical stress imbalance, ease joint pain, and lower the risk of OA. Moderate exercise helps muscles become stronger and may slow the progression of OA. Alternative therapies like spa, massage, and acupuncture are also advantageous although their efficacy is not sufficiently supported by research. Due to the invasive trauma and higher dangers, surgery is only taken into consideration for severe situations when conservative therapy has failed. The best orthopedic surgery for advanced OA is total joint replacement/arthroplasty. It might ease discomfort and enhance joint performance. Unfortunately, arthroplasty is not advised for young patients since the artificial implant has a limited lifespan (usually 10-15 years). The most popular OA treatment option is pharmaceutical therapy, which primarily focuses on pain relief and anti-inflammation and includes acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), opioid analgesics, serotonin-norepinephrine reuptake inhibitors (SNRIs), and intra-articular injections [22].

According to data, OA, one of the most common causes of disability, affects over 100 million individuals globally. Younger people may also be more vulnerable to injury-induced OA. The prevalence of this disease is shown by the fact that more than 50% of people worldwide (>65 years) have X-ray evidence of OA in one of their joints.

Although OA affects both men and women equally, it seems to be more prevalent in younger men (age 45) and older women (age >45) [23, 24].

Therefore, an effort has been undertaken in this research to investigate the nutritional state of senior individuals and its relationship to osteoarthritis. This study makes use of the Western Ontario and McMaster Universities Arthritis Index (WOMAC). It is frequently used to assess osteoarthritis of the hip and knee. The 24 items on the self-administered questionnaire are broken down into 3 subscales. The nutritional condition of the OA patients was assessed using the Mini Nutritional Assessment (MNA). The MNA test, which consists of 18 easy-to-measure elements and can be completed in about 15 minutes, is thought to be a reasonable option for setting up a tool for quick and straightforward evaluation of nutritional status. This study's objective is to assess osteoarthritis and its relationship to nutrition among elderly patients in Dhaka City.

2. Methodology

2.1 Study design: It was a cross sectional descriptive type of study. This study was conducted at Comfort Hospital and National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR) Bangladesh. The study period was conducted for two years started from January 2020 to December 2021. The study was conducted among old osteoarthritis population attending NITOR and COMFORT Hospital for treatment purposes.

2.2 Sampling: This study was conducted as per non-randomized, purposive sampling technique, also known as judgmental, selective, or subjective sampling, is a form of non-probability sampling in which researchers rely on their own judgment when choosing members of the population to participate in their surveys.

Sample size for the study was decided by following equation. n=z2xpq/d2

Here,

n= desired sample size

z= Value of standard normal distribution as given level of significant (confidence level) usually considered value 1.96% confidence interval (CI)

Prevalence of OA more than 50 years (12.3%)[25]

p= 12.3% or .12.3, q= 1-P= (1 – .12.3) = .877

d= degree of accuracy desired usually set at 5% (0.05)

So by this equation

N=(1.96)2 x {(0.12.3) x (0.877)}/ (.05) 2 = 0.7203/0.0025

Sample size was n= 166

Considering non response, missing data, sampling error 10% extra sample selected. Therefore the finally 192 samples were selected for this study.***nclusion and exclusion Criteria:***

Inclusion Criteria:

1. Patient suffering from osteoarthritis and willing to participate in the study

Exclusion Criteria:

1. Very sick patient 2. Mentally retarded 3. Not willing to participate in the study was excluded from this study.

2.3 ***Data Collection Tools and Techniques:*** Data were collected by using a pre designed semi-structured questionnaire. Both WOMAC and MNA tools were used for data collection. The questionnaire was prepared reviewing literature and consulting with medical research experts. Information about health status, nutritional status, and dietary pattern along with socio-demographic characteristics was also obtained. By face to face interview of respondents with pre designed semi-structured questionnaire. The field work was conducted in NITOR and Comfort Hospital. The respondents were selected consecutively who met the inclusion and exclusion criteria.

2.5 Statistical analysis: Statistical package for social science (SPSS) version 23.0 (Chicago). All collected data were coding and input in SPSS-23 for further analysis. Both descriptive and inferential statistics were conducted. Descriptive statistics included frequency distribution, percent, mean, standard deviation; graph, tables, figures. In inferential statistics association between independent & dependent variables was calculated by Chi-square(x^2) test.

3. Results

Among192 respondents, 55.2% respondents belong to 60-69 years and the frequency of this group is 106. On the other hands the lowest 6.3% respondents belong to 80-89 years. Moreover, 38.5% belongs to 70-79 years where, frequency is 74. Mean age 74.50±14.40. 58.85% of the respondents were female and 41.15% were male. Table 1 also reveals the distribution of the respondents by religion where majority were Muslim (94.79%) and 5.21% were Hindus. Highest (44.80%) respondents were housewife followed by retired person (35.42%), service holder (17.70%) and business (2.08%). Total 53.1% osteoarthritis patients were diagnosis with normal MNA score (24-30) but 46.9% patients were at risk of malnutrition score (17-23.5) (Table 2).

Table 1: Distribution of the respondents by socio-demographic profile (n=192)

Age group	**Frequency**	**Percent**	**Mean±SD**
60 to 69	106	55.2%	74.50±14.40
70 to 79	74	38.5%	
80 to 89	12	6.3%	
Gender			
Male	79	41.15%	
Female	113	58.85%	
Religion			
Muslim	182	94.79%	
Hindu	10	5.21%	
Occupation			
Housewife	86	44.80%	
Retired	68	35.42%	
Service holder	34	17.70%	
Business	04	2.08%	

Table: 2 Age group and MNA

Age Group		Mini Nutritional Assessment	
		Normal (24-30)	At risk of malnutrition (17-23.5)
Age	60-69	54	52
		28.1%	27.1%
	70-79	41	33
		21.3%	17.2%
	80-89	7	5
		3.6%	2.6%
		25.0%	19.8%
Total		102	90
		53.1%	46.9%

Figure 1 shows highest 33 (17.28%) overweight BMI patients were at risk in malnutrition and 32 (16.75%) normal BMI patients who were at risk in malnutrition.

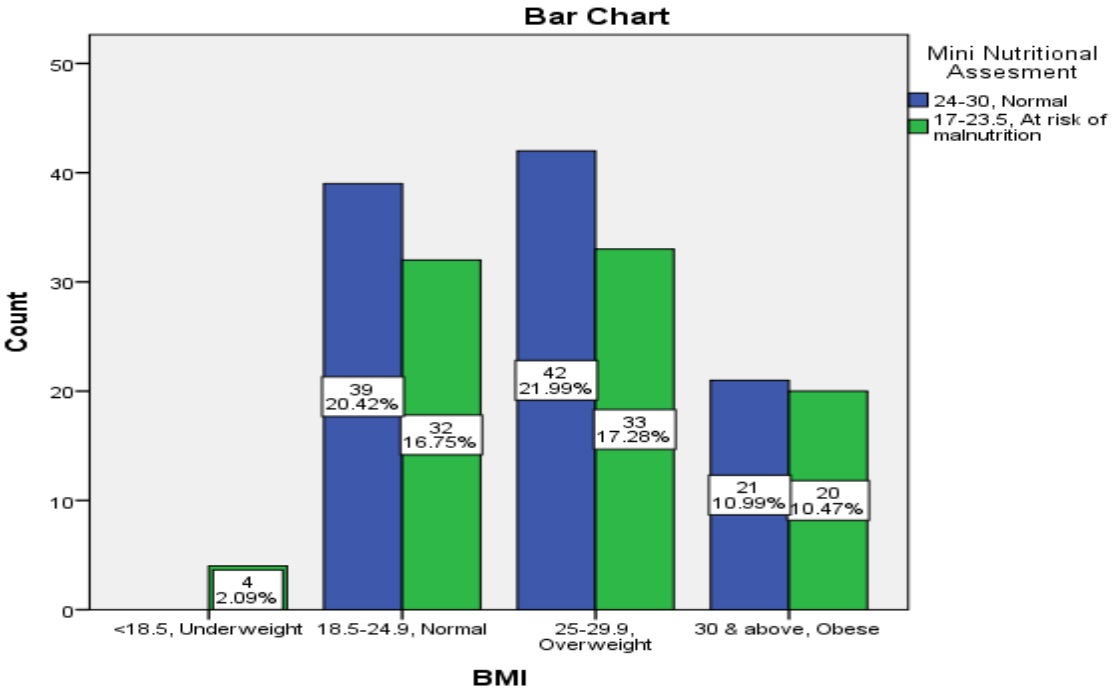

Figure 1: MNA outcome as per BMI

Bivariate Correlation between WOMAC and MNA show that association among WOMAC score with pain, stiffness, difficulties was significant and screening and assessment score was significant with MNA which indicate high level reliability and validity of the result (Table 3). Table 4 shows that among 192 participants food consumption rate for 6-7 days, 4-5 days,1-3 days and no intake was reported staple (cereals)(60.4%, 32.3%, 7.3% and 0%), pulse & nuts (40.1%,31.3%, 20.8% and 7.8%), vegetables (56.3%,30.7%, 11.5% and 1.6%), fruits (17.7%,39.6%,39.1% and 3.6%), meat & fish (10.4%, 19.3%, 59.9% and 10.4%), dairy (32.8%, 32.8%, 28.6% and 5.7%), sugar (36.5%, 23.4%, 19.8% and 20.3%) and oil (83.3%, 14.6%, 2.1% and 0%). According to Food consumption score by the perspective of Bangladesh region we have used the thresholds that contains ≤28 as poor consumptions, >28 - ≤42 as borderline consumptions, 43-52 as low acceptable and >52 considered as high acceptable consumption. By this calculation method we have found among 192 respondent's majorities were (76.5%) high acceptable consumption, 19.7% were in low acceptable consumption level and 3.6% were in border line consumption level (Figure 2).

Table 3: Bivariate Correlation between WOMAC an MNA

Correlations Assessment		Pain	Stiffness	Difficulty	WOMAC	Screening	Assessment	MNA
Total Pain Score	Pearson Correlation	1	.242**	.611**	.800**	-.033	.009	-.023
	Sig. (2-tailed)		.001	.000	.000	.651	.898	.756
	N	192	192	192	192	192	192	192
Stiffness score	Pearson Correlation	.242**	1	.105	.253**	-.071	.097	-.003
	Sig. (2-tailed)	.001		.147	.000	.330	.180	.965
	N	192	192	192	192	192	192	192
Difficulty score	Pearson Correlation	.611**	.105	1	.958**	.024	-.016	.011
	Sig. (2-tailed)	.000	.147		.000	.745	.825	.883
	N	192	192	192	192	192	192	192
WOMAC	Pearson Correlation	.800**	.253**	.958**	1	.001	.000	.001
	Sig. (2-tailed)	.000	.000	.000		.992	.998	.992
	N	192	192	192	192	192	192	192
Screening score	Pearson Correlation	-.033	-.071	.024	.001	1	-.071	.811**
	Sig. (2-tailed)	.651	.330	.745	.992		.325	.000
	N	192	192	192	192	192	192	192
Assessment score	Pearson Correlation	.009	.097	-.016	.000	-.071	1	.526**
	Sig. (2-tailed)	.898	.180	.825	.998	.325		.000
	N	192	192	192	192	192	192	192
Mini Nutritional Assessment	Pearson Correlation	-.023	-.003	.011	.001	.811**	.526**	1
	Sig. (2-tailed)	.756	.965	.883	.992	.000	.000	
	N	192	192	192	192	192	192	192

**. Correlation is significant at the 0.01 level (2-tailed).

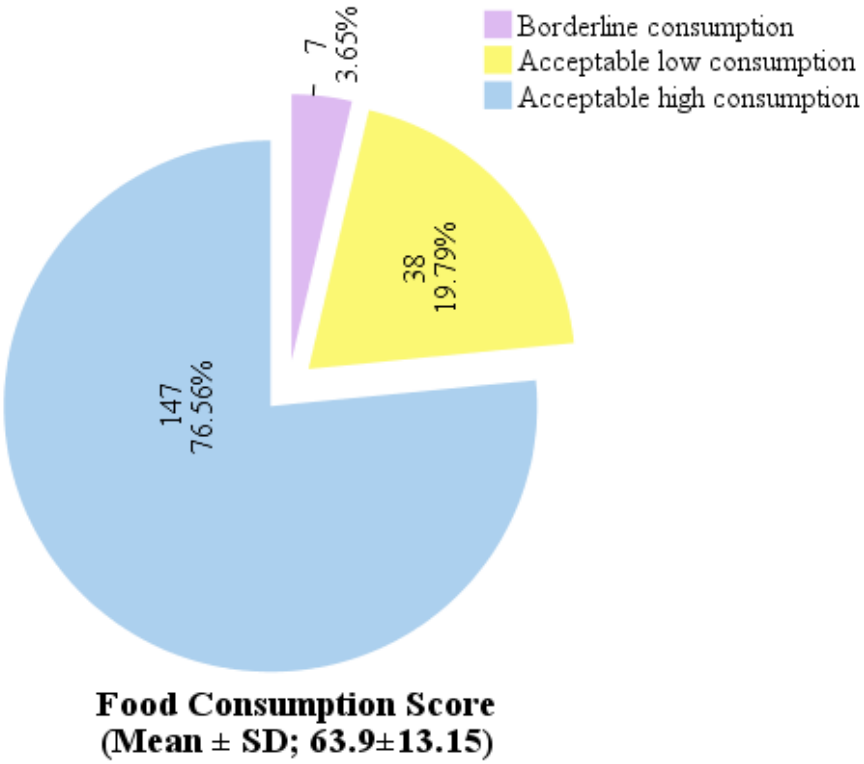

Figure 2: Food Consumption Score

Table 4: Dietary consumption pattern in the household of the respondents in last seven days

Food Groups	No intake	1-3 days	4-5 days	6-7 days
Staple (Cereals)	0	0	0	192(100%)
Pulse & Nuts	40(20.8%)	60(31.3%)	15(7.8%)	77(40.1%)
Vegetables	3(1.6%)	22(11.5%)	59(30.7%)	108(56.3%)
Fruits	7(3.6%)	75(39.1%)	76(39.6%)	34(17.7%)
Meat &Fish	20(10.4%)	115(59.9%)	37(19.3%)	20(10.4%)
Dairy	11(5.7%)	55(28.6%)	63(32.8%)	63(32.8%)
Sugar	39(20.3%)	38(19.8%)	45(23.4%)	70(36.5%)
Oil	0	2(1.04%)	10(5.2%)	180(93.75%)
N=192 (100%)				

Table 3 shows a significant relationship found between FCS with osteoarthritis (p>0.001). The rate of persons with borderline consumption level reported 1.6% had both moderate & severe and 0.5% had extreme level osteoarthritis. Low persons with acceptable consumption level reported 8.9% moderate, 10.9% severe and no extreme level osteoarthritis found. Persons with high acceptable consumption level reported 41.1% had moderate, 31.8% had severe and 3.6% had extreme level osteoarthritis. According to paired sample t test staple(cereals), Pulse& nuts, fruits, meat& fish, dairy, sugar and oil found significant associated with both osteoarthritis and nutritional status (p<0.001). However, no significant association found between vegetable intakes with osteoarthritis (p>0.05) but a significant relationship found with nutritional status (p<0.001) (Table 4).

Table 5: Relationship Osteoarthritis and FCS

FCS	Osteoarthritis			P- Value
	Moderate	Severe	Extreme	
Borderline consumption	3	3	1	**0.004**
	1.6%	1.6%	0.5%	
Acceptable low consumption	17	21	0	0.002
	8.9%	10.9%	0.0%	
Acceptable high consumption	79	61	7	0.000
	41.1%	31.8%	3.6%	

Table 6: Correlation assessment between Food intake with Osteoarthritis and Nutritional status

		Staple (Cereals)	Pulse & Nuts	Vegetables	Fruits	Meat &Fish	Dairy	Sugar	Oil
Osteoarthritis									
SE		.85	.08	.06	.07	.07	.08	.09	.05
95% CI	Lower	-47.4	-.654	-.246	-.95	-1.3	-.75	-.94	.18
	Upper	-44.1	-.325	.027	-.67	-1.09	-.44	-.58	.38
t		-53.5	-5.8	-1.5	-11.3	-17.6	-7.5	-8.4	5.5
P-value		.000	.000	.11	.000	.000	.000	.000	.000
Mini Nutritional Assessment									
SE		.05	.07	.06	.06	.06	.06	.09	.04
95% CI	Lower	1.95	1.4	1.82	1.11	.69	1.32	1.1	2.25
	Upper	2.16	1.7	2.07	1.3	.96	1.5	1.4	2.42
t		38.13	20.56	31.36	18.3	12.1	20.8	13.8	53.9
P- value		.000	.000	.000	.000	.000	.000	.000	.000

4. Discussion

In our study Among the 192 respondents highest (55.2%) respondents belong to 60-69 years. Mean age 74.50±14.40. Majority 58.85% of the respondents were female (113) and 41.15% were male. Total 102 (53.1%) osteoarthritis patients were diagnosis with normal MNA score (24-30) but 90 (46.9%) patients were diagnosis with at risk of malnutrition score (17-23.5). Highest 33 (17.28%) overweight BMI patients were at risk in malnutrition and 32 (16.75%) normal BMI patients who were at risk in malnutrition. These results indicate a large number of osteoarthritis patients are at risk of malnutrition.

Ahmed et al. (2018) successfully recruited and completed the MNA-SF for their study, which included respondents 60 years of age and older. The majority of them remained in metropolitan areas and were distributed based on sex. Similar to our study, the highest percentages in their study (52.9%) were female and (47.1%) were male. The prevalence of malnutrition and at-risk of malnutrition by MNA-SF among the elderly in Malaysia was 7.3 percent and 23.5 percent, respectively, in the same study's overall analysis. Elderly Chinese, older Bumiputra Sarawak, and older adults with a BMI of 25 kg/m2 or more were all shown to be considerably more likely to be at risk for malnutrition, with odds ratios of less than one.[26] In Felda Sungai Tengi, Selangor, a 2013 survey of Malay older persons revealed that 42.5% of the elderly were malnourished or at danger of malnutrition.[27] Due to the fact that all of our respondents were osteoarthritis patients aged sixty and older, the risk of malnutrition in our study is comparatively higher than in other studies. Elderly people with BMIs more than 25 kgm2 were protected against malnutrition or at-risk conditions. However, because malnutrition or the danger of malnutrition may exist even in individuals with higher BMIs, BMI should not be used as a substitute for an accurate nutritional examination.[28]This result is similar to our study.In our study, there was a highly significant correlation between the WOMAC score and discomfort, stiffness problems, and between the screening and assessment score and MNA. WOMAC scores and the Lequesne OA algofunctional index had very significant correlations, according to a 2003 study by Salaffi et al. Radiological OA severity was correlated with WOMAC physical function, but not with WOMAC stiffness and pain subscales (P=0.03).[29]

Woldikiden et al (2019) shows that by comparing the total MNA score to the anthropometric measurements as criteria, the criterion-related validity of the MNA tool was evaluated. The relationship between the overall MNA score, weight, CC, MUAC, and BMI was found to be significantly positive. Among these, the MNA score demonstrated a stronger positive association to weight and BMI (r = 0.58, p 0.001). The MNA tool's concurrent validity was determined by comparing the participants' self-perceived nutritional status to their overall MNA score. Significant correlations between the MNA and self-reported nutritional status were found (r = 0.43, p 0.001).[30] The result is also similar to our study.

We have found among 192 respondent’s majorities were (76.5%) high acceptable consumption, 19.7% were in low acceptable consumption level and 3.6% were in border line consumption level. Significant relationship found between FCS with osteoarthritis (p>0.001) and a significant relationship found with nutritional status.

In the study of Chang Xu et.al (2020) reveals that the radiographic and clinical development of KOA were both significantly influenced by food choices. Increased KL-worsening risk was associated with higher Western pattern scores, but there was no

appreciable difference in JSW loss. There was a lower likelihood of KL-worsening as the prudent pattern score increased. While adopting a sensible diet was linked to reduced progression, following a Western diet was linked to higher radiographic and symptomatic KOA progression. Eating a diet high in fruits, vegetables, seafood, healthy grains, and legumes is generally associated with a reduced radiographic and clinical disease progression in persons with KOA.[31]

5. Conclusion:

This study demonstrated that male nutritional risk and osteoarthritis are prevalent in older adults, with females being more affected than males. The majority of respondents in this survey were housewives. It suggests that OA affects housewives more severely. Additionally, this research project highlights the overall demographics of OA patients in Dhaka city, including age group, gender distribution, weight variation, socioeconomic status, occupation, pain style, stiffness, and difficulties. In conclusion, osteoarthritis is a serious public health issue, particularly for elderly people. In this study, it was found that osteoarthritis and MNA, WOMAC, dietary status, and physical activity are significantly correlated. To reduce OA and male nutrition, there is a need for more knowledge, adequate treatment and management, a proper diet, and a modified lifestyle.

REFERENCES

1. UN Department of Economic and Social Affairs, Population Division. World population ageing 2013 [Internet]. 2013. ST/ESA/SER.A/348. [cited 2016 Jun 24]. Available from: http://www.un.org/esa/socdev/ documents/ageing/Data/WorldPopulationAgeingReport2013.pdf.

2. National Institute on Aging. Global health and aging [Internet]. Washington (DC): US Department of Health and Human Services; 2011. NIH Publication No.: 11-7737. [cited 2016 Jun 24]. Available from: https://www.nia.nih.gov/research/publication/global-health-andaging/ preface.

3. Heuberger, R.A.; Caudell, K. Polypharmacy and nutritional status in older adults: A cross-sectional study. *Drugs Aging* **2011**, *28*, 315–323.

4. Ortolani, E.; Landi, F.; Martone, A.M.; Onder, G.; Bernabei, R. Nutritional status and drug therapy in older adults. *J. Gerontol. Geriatr. Res.* **2013**, doi:10.4172/2167-7182.1000123.

5. Azadbakht, L. and A. Esmaillzadeh, 2009. Red meat intake is associated with metabolic syndrome and the plasma C-reactive protein concentration in women. J. Nutr.,139:335-339. 6. Clinton, C.M., S. O'Brien, J. Law, C.M. Renier and M.R. Wendt, 2015. Whole-foods, plant-based diet alleviate the symptoms of osteoarthritis. Arthritis, Vol. 2015. 10.1155/2015/708152

7. Gomes M, Neto, Araujo AD, Junqueira ID, Oliveira D, Brasileiro A, Arcanjo FL. Comparative study of functional capacity and quality of life among obese and non-obese elderly people with knee osteoarthritis. Rev Bras Reumatol.Engl Ed. 2016;56(2):126–130. Portuguese. [PubMed]

8. Fransen M, Bridgett L, March L, Hoy D, Penserga E, et al. (2011) The epidemiology of osteoarthritis in Asia. Int J Rheum Dis 14: 113-121.

9. Litwic A, Edwards MH, Dennison EM, Cooper C (2013) Epidemiology and burden of osteoarthritis. Br Med Bull 105: 185-199.

10. Altman R, Asch E, Bloch D, Bole G, Borenstein D, et al. (1986) Development of criteria for the classification and reporting of osteoarthritis. Classification of osteoarthritis of the knee. Diagnostic and Therapeutic Criteria Committee of the American Rheumatism Association. Arthritis Rheum 29: 1039-1049.

11. Hochberg MC, Lawrence RC, Everett DF, Huntley JC (1989) Epidemiologic associations of pain in osteoarthritis of the knee: data from the National Health and Nutrition Examination Survey and the National Health and Nutrition Examination. 1: epidemiologic follow-up survey. Semin Arthritis Rheum 18: 4-9.

12. Zhang Y, Jordan JM (2010) Epidemiology of osteoarthritis. Clin Geriatr Med 26: 355-369.

13. Alexander M, Philip G (2017) Conaghan Synovitis in osteoarthritis: current understanding with therapeutic implications. Arthritis Res Ther 19: 18.

14. Altman R, Asch E, Bloch D, Bole G, Borenstein D, et al. (1986) Development of criteria for the classification and reporting of osteoarthritis. Classification of osteoarthritis of the knee. Diagnostic and Therapeutic Criteria Committee of the American Rheumatism Association. Arthritis Rheum 29: 1039-1049.

15. Kafil N, Aamir K, Murad S, Ara J, Anjum S (2003) A placebo controlled clinical trial on Nimesulide in Osteoarthritis. J Surg Pakistan 8: 5-8.

16. Zhang W, Doherty M, Peat G (2010) EULAR evidence-based recommendations for the diagnosis of knee osteoarthritis. Ann Rheum Dis 69: 483-489.

17. Kellgren JH, Lawrence JS (1957) Radiological assessment of osteo-arthrosis. Ann Rheum Dis 16: 494-502.

18. Cooper C, Javaid MK, Arden N (2014) Epidemiology of osteoarthritis. In: Atlas of Osteoarthritis. Springer Healthcare, Tarporley. pp 21-36.

19. Akinpelu AO, Alonge TO, Adekanla BA, Odole AC (2009) Prevalence and pattern of symptomatic knee osteoarthritis in Nigeria: A community-based study. Internet J Allied Health Sci Pract 7: 3.

20. Chaiamnuay P, Darmawan J, Muirden KD, Assawatanabodee P (1998) Epidemiology of rheumatic disease in rural Thailand: a WHO–ILAR COPCORD study. Community Oriented Programme for the Control of Rheumatic Disease. J Rheumatol 25: 1382-1387.

21. Rahman MM, Cibere J, Anis AH, Goldsmith CH, Kopec JA (2014) Risk of Type 2 Diabetes among Osteoarthritis Patients in a Prospective Longitudinal Study. Int J Rheum.

22. Zhang W, Ouyang H, Dass CR, Xu J (2016) Current research on pharmacologic and regenerative therapies for osteoarthritis. Bone Res 4: 15040.

23. Bhatia D, Bejarano T, Novo M (2013) Current interventions in the management of knee osteoarthritis. J Pharm Bioallied Sci 5: 30-38.

24. Liikavainio T, Bragge T, Hakkarainen M, Karjalainen PA, Arokoski JP (2010) Gait and muscle activation changes in men with knee osteoarthritis. Knee 17: 69-76.

25. Venkatachalam J, Natesan M, Eswaran M, Johnson AK, Bharath V, Singh Z. Prevalence of osteoarthritis of knee joint among adult population in a rural area of Kanchipuram District, Tamil Nadu. Indian J Public Health [serial online] 2018 [cited 2022 Jun 28];62:117-22.

26. Mohamad Hasnan Ahmad, Ruhaya Salleh, Cheong Siew Man, Munawara Pardi, Norsyamlina Che Abdul Rahim, Norhafizah Shahril, Mohd Hatta Abdul Mutalib, Suzana Shahar, Noor Ani Ahmad, "Malnutrition among the Elderly in Malaysia and Its Associated Factors: Findings from the National Health and Morbidity Survey 2018", *Journal of Nutrition and Metabolism*, vol. 2021, Article ID 6639935, 8 pages, 2021. https://doi.org/10.1155/2021/6639935

27. S. Suzana, P. C. Boon, P. P. Chan, and C. D. Normah, "Malnutrition risk and its association with appetite, functional and psychosocial status among elderly Malays in an agricultural settlement," *Malaysian Journal of Nutrition*, vol. 19, no. 1, pp. 65–75, 2013.

28. G. Bahat, F. Tufan, B. Saka et al., "Which body mass index (BMI) is better in the elderly for functional status?" *Archives of Gerontology and Geriatrics*, vol. 54, no. 1, pp. 78–81, 2012.

29. Salaffi F, Leardini G, Canesi B, Mannoni A, Fioravanti A, Caporali R, Lapadula G, Punzi L; GOnorthrosis and Quality Of Life Assessment (GOQOLA). Reliability and validity of the Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index in Italian patients with osteoarthritis of the knee. Osteoarthritis Cartilage. 2003 Aug;11(8):551-60. doi: 10.1016/s1063-4584(03)00089-x. PMID: 12880577.

30. Mesfin Agachew Woldekidan, Demewoz Haile, Bilal Shikur & Seifu Hagos Gebreyesus (2021) Validity of Mini Nutritional Assessment tool among an elderly population in Yeka sub-city, Addis Ababa, Ethiopia, South African Journal of Clinical Nutrition, 34:3, 103-109, DOI: 10.1080/16070658.2020.1741903.

31. Chang Xu, Nathalie E Marchand, Jeffrey B Driban, Timothy McAlindon, Charles B Eaton, Bing Lu, Dietary Patterns and Progression of Knee Osteoarthritis: Data from the Osteoarthritis Initiative, *The American Journal of Clinical Nutrition*, Volume 111, Issue 3, March 2020, Pages 667–676, https://doi.org/10.1093/ajcn/nqz333