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EFFECTIVENESS OF JUMPSTART NUTRITION® SUPPLEMENT THERAPY IN THE MANAGEMENT OF ANTHROPOMETRIC PARAMETERS WITH KNEE OSTEOARTHRITIS OLDER ADULTS IN COVID-19 PANDEMIC

Biochemistry

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ABSTRACT

Background: Anthropometric Parameters (APs) are characterised by general and central obesity which mainly include body mass index (BMI), waist circumference (WC), waist-to-hip ratio (WHpR), and waist-to-height ratio (WHtR). The obesity generates anomalous joint loads and leads to destructive changes in the chemical composition, structure, and properties of articular cartilage thus to develop knee osteoarthritis (KOA). The load on the deformed joints may arise with enhanced body segment girths, imbalanced skeletal muscle, increased inflammatory cytokine production, and posture that control the joint movements. This study aimed to compare the effectiveness of the risk factors of APs in obese older adults with KOA, enhancing in COVID-19 pandemic after Jumpstart Nutrition® dietary supplement (JNDS) therapy and dietetic protein with combined aerobic and resistance exercise therapy (DPARET) for week-12

Methods: A randomized controlled study underwent with 342 obese individuals, aged between 40-80 years. Of 180 cohorts (n=115, ≥60years) treated with JNDS mainly prepared with calcium, phosphorus, vitamin-K_2, coenzyme-Q_{10}, boswellic acids, and curcumin mixed with soy and whey protein and 162 (n=57, ≥60years) treated with DPARET for APs with KOA confirmed radiologically. Questionnaire data on weight, height, waist and hip circumference, and confounding factors (heredity, smoking, knee injuries, and physical activity) were collected and analyzed.

Results: At week-twelve, the respective values of area under the ROC curves of the APs for pooled experimentalcohorts (≥60years) were 0.894, 0.804, 0.828, and 0.856 having R-squares: 81.56%, 91.23%, 83.48%, and 82.35%, indicting a satisfactory treatment policy, and their mean± SD, all exhibited highly significant differences ($p<0.0001$) and KOA-gradation was upgraded to ≥2 from ≥4 as per Kellgren-Lawrence scale compared to control.

Conclusion: Results indicate the use of JNDS could be the best possible alternative for the management of APs in advanced age with KOA especially during Covid-19 pandemic compared to DPARET correlated with ROC curves and Kellgren-Lawrence scale.

KEYWORDS

knee osteoarthritis; dietary protein with exercise; JNDS; anthropometric parameters; COVID-19

1. INTRODUCTION:

Alphonse Bertillon (1853-1914) is considered as the father of anthropometrics based on his classification system known as the anthropometric system or judicial anthropometry. Anthropometric measurements describe the systematic dimensional description of body size and shape of the human body. The anthropometric parameters mainly include body mass index (BMI), waist circumference (WC), waist-to-height ratio (WHtR), and waist-to-hip ratio (WHpR) **[1].**

In old age, anthropometric characteristics are exposed to most common progressive joint disease such as knee osteoarthritis (KOA), leading to alter body alignment and configuration. There is a longitudinal decrease of height because of vertebral compression, change in height and structure of disks, bone erosion, loss of muscle tone, and postural changes in aging **[2]**. It is more predominant in women aged 60 years or more compared to men of the same age (13% vs. 10%) **[1]**.

In the latest years, the proportion of the aged in India has been increasing at a growing rate. By 2050, the share of inhabitants over the age of 60, estimated to rise to19 percent from 8 percent in 2015 **[3].**

The results of some studies showed KOA is associated with heredity, age, sex, obesity, previous knee injury, occupational factors, physical activity, knee malalignment, and smoking (protective factor) **[3].** In these risk factors, anthropometric measures are the essential features for evaluating the prognosis of chronic and acute diseases, especially KOA. These will support to assess the overweight, obesity, muscular mass loss, fat mass gain, and adipose tissue redistribution and to guide medical intervention in the elderly **[4].**

Both muscle tissue and fats mass develop with improved bodyweight ensuing, in which the quantity of muscle mass remains rather low and insufficient to in shape the loads located upon it. Obese persons have lower muscle strength than normal-weight counterparts, including the quadriceps **[4]** and lumbar muscle groups, when strength normalizes for the body mass. In obesity, people attempt to compensate for muscle weakness and instability by modifying gait patterns and adopting different forms of body movement to transmit excessive weight. As obesity worsens, these biomarkers induce a feed-forward process of muscle catabolism and loss of strength **[5]**. Due to the cumulative effects of excessive body fat, and mechanical loading and abnormal joint motion over the period, develop the KOA pathophysiology, inflammation, and pains areproduced **[5].**

Many epidemiological studies have demonstrated that different anthropometric measures for abdominal or central obesity such as WC, WHpR, and WHtR are reliable and consistent predictors for various diseases. These include musculoskeletal diseases, mainly KOA **[6],** noncommunicable diseases (Type II diabetes mellitus)**,** and cardiovascular disease **[7]**.

However, there is ambiguity regarding the most suitable means by which to define excess body weight remains. Traditionally, BMI has been the most widely used method by which to determine the prevalence of overweight in-and-across populations as well as an individual's level of risk. However, in recent times, measures of central obesity, principally WC and WHpR and to a greater extent, the WHtR **[8]** which more accurately describes the distribution of body fat, which reflects central adiposity, has been suggested to be superior to BMI.

The alternative treatment of increased dietary protein **[9]** with aerobic and resistance exercise therapy (DPARET) for improving body fat distribution suggest the effective management of weight loss and for defining prevention strategies for the weight-related morbidity such as KOA **[10]**.

Dietary proteins exert a high satiating effect through various pathways, including stimulation of gut hormone secretion, digestion effects, circulating amino-acid levels, energy expenditure, a ketogenic state, and possibly gluconeogenesis **[9].** Aerobic exercise typically involves sustained extensive muscle activity such as walking, climbing stairs, stationary cycling, or aquatic aerobic exercise. Resistance exercise features the use of resistance exercise machines, strengthening exercise using bodyweight and home-based strengthening exercises **[10].**

But this is commonly recommended for improving and maintaining optimal concentrations of lipids and lipoproteins in overweight and obese adults for cardio-metabolic risk factors. However, the researchers have established that the combined effects of aerobic exercise and dietetic proteins aimed at improving total cholesterol (TC), high-density lipoprotein cholesterol (HDLC), the ratio of TC: HDLC, low-density lipoprotein cholesterol (LDLC), and triglycerides (TG) in adults have reached conflicting conclusions for the treatment of KOA **[11-12].**

At the same time, researchers have proved that the different protein extracts damage the liver when used for bodybuilding and weight loss.

It has led to studies of the composition of different supplements [**12].**

Moreover, the author has already established that the oxidative stress (a physiological condition or to the situation of a serious imbalance between production of reactive oxygen species/reactive nitrogen species (ROS/RNS) and antioxidant defence) promotes cartilage destruction responsible for prognosis of osteoarthritis [**13].** Resulting which, in the current emergency of COVID-19 pandemic might have a large impact on perceived stress and psychobiosocial states with confinement, isolation and situations of uncertainty associated with increased negative affect and feelings in adults [**14].** These have high negative impact on the treatment of aberrant levels of anthropometric parameters with KOA by DPARET **[15].**

Therefore, the patients with KOA need treatment for the factors as reflected in biochemical, anatomical, and radiological parameters along with general and abdominal obesity. There is lacking these factors in the modern alternative treatment with dietary protein **[10]** and combined high-intensity aerobic and resistance exercises **[10-11**]. Moreover, elderly persons with KOA are restricted from doing any exercise due to acute pain and inflammation on the knee joints and unable to consume extra dietary protein because of their other associated health problems especially at the time of present COVID-19 pandemic situation **[14-15].**

For this purpose, as an alternative treatment for the KOA, Jumpstart Nutrition® dietary supplement (JNDS) is suggested [**16-18].** In the previous studies, the author has elaborated in detail the functions of the several powerful ingredients used in JNDS **[16-18**]. The calcium, phosphorus, magnesium, vitamin-K_2, coenzyme-Q_{10}, vitamin-C, boswellic acids and curcumin mixed with soy and whey proteins are the main components in JNDS, which help to overcome these abnormal anthropometric measures along with acute pain and inflammation in the joints developed during KOA **[16-19].**

This current study aims to regulate the severity of epidemiology of general and central obesity such as WC, WHtR and WHpR corresponding to BMI developed during KOA to be more severe in COVID-19 pandemic by using JNDS as the best alternative compared to the modern treatment with increased dietary protein and combined high-intensity aerobic and resistance exercise therapy at old age for twelve-week evidenced by the Kellgren-Lawrence scale with radiological images.

2. MATERIALS AND METHODS:

2.1 *Recruitment of patients:*

The survey was conducted in metropolitan cities in India, those who are coming for the treatment of musculoskeletal diseases in OPTM Health Care Pvt Ltd (Government approvedclinics) from March 2020 to May 2020. Out of 932 approached participants, a total of 897 Indian participants of different ethnics group, aged between 40 to 80 years, suffering from confirmed radiographic KOA for more than six years, with no other chronic disease in the past five years and no hospital admissions during two months before answering the survey were recruited in this week-12 registry.

The questionnaire included sociodemographic variables such as age, formal education, civil status, family situation, and income. The measures analysed were weight, height, body mass index (BMI), waist and hip circumferences, waist to hip ratio (WHpR), and waist-to-height ratio (WHtR) according to the standardized techniques **[20].**

2.2 *Exclusion criteria*:

Five hundred fifty-five of 897 cohorts with cancer, diabetes mellitus, dyslipidemias, gout, arterial hypertension, heart attack, vascular brain events, chronic pulmonary obstructive disease, mental disorders, liver cirrhosis, gallbladder lithiasis, gastric or duodenal ulcer, chronic renal failure, kidney lithiasis, prostate hyperplasia, hip or femur fracture and other fractures and also patients who did not agree to physical and radiological evaluations, and /or attend weekly follow-up visits were all included in exclusion criteria.

2.3 *Study design*:

After evaluating the exclusion criteria, 180 of the remaining 342 patients suffering from acute KOA confirmed with radiological images having severe pain with disabling lifestyle because of abnormalanthropometric parameters were treated with JNDS considered as experimental patients and the remaining 162 subjects were treated with dietary protein and combined high intensity aerobic and resistance exercise considered as control subjects.

2.4 *Evaluation of Anthropometric measurements*:

The current primary anthropometric indices such as BMI, WC, WHpR, and WHtR were measured by a qualified experienced registered nutritionist.

Body mass index (BMI) was calculated using the formula weight (kg)/height (m) ^{2}. The waist circumference (WC) and the hip circumference (HC) in centimeters were measured, using a non-stretchable measuring tape, at the end of several consecutive natural breaths, at a level parallel to the floor, at the midpoint between the top of the iliac crest and the lower margin of the last palpable rib in the midaxillary for WC and at the largest circumference of the buttocks for HC.

The waist circumference was used to identify individuals with possible health risks based upon threshold values of ≥ 88 cm for women and ≥ 102 cm for men **[20].**

Waist-to-hip ratio (WHpR) was estimated by dividing waist circumference by hip circumference and the waist-to-height ratio (WHtR) is a measure of the waist circumference divided by the height. The threshold values for WHpR and WHtR were evaluated for both the groups as per the recommended protocol of the World Health Organization, 2008 as ≥ 0.85 for women and ≥ 0.90 for men and ≥ 0.58 for women and ≥ 0.63 for men respectively **[20].**

The box and whiskers plots, Radar charts for the percentage of improvements of anthropometrics, respective areas under the curves of receiver operating characteristics (ROC) with the values of R-squares, sensitivity, specificity, positive and negative predictive values, cut off points and their *p*-values were evaluated for all the anthropometric parameters at week-12 for both the groups according to their age groups of 40-60 and 60-80 years.

2.5 *Evaluation of radiological images with the Kellgren-Lawrence grading scale:*

To identify tibiofemoral OA and patellofemoral OA bilateral posteroanterior (PA) weight-bearing knee radiographs were used. Tibiofemoral disease severity was determined using the Kellgren-Lawrence grading scale that includes the formation of osteophytes, narrowing of joint cartilage, sclerosis of subchondral bone, and altered shape of bone ends with 0 = no disease; 1 = questionable; 2 = definite; 3 = moderate; and 4 = severe **[21].**

The AP view of knee joints X-ray images of two such patients (before and after the treatment) are separately evaluated for both the groups.

2.6 *Management of supplement studies*:

The formulation has been scientifically evaluated by Nanophyto wellness Pvt Ltd, Kolkata, India. The pharmacokinetics of the ingredients used in the supplement along with their dietary reference intakes (DRIs), their compositions, sources of raw materials and aim of the supplementary study have already been discussed in the previous studies [**16-18].**

2.7 *External study reviewers:*

All results and data before and after the treatment were evaluated by an external reviewing panel, not in contract with the registry patients.

2.8 *Statistical methods*

Data were recorded, validated, and stored using the Statistical Package for the Social Sciences (SPSS) Windows software, version 11.0 [**22**]. The frequency and distribution of the characteristics of the elderly were analyzed using analysis of variance (ANOVA) to identify any age and the parametic differences between anthropometric measurements in women and men and within the whole sample. Student's t-test was used to evaluate differences between men and women according to age, the parametric values, and to determine significant values at $p<0.05$ level among two variables for measuring different improvement parameters of female-only and male-only patients separately. An alpha level of 5% was established i.e., a p-value less than 0.05 was considered statistically significant.

2.9 *Ethical approval:*

The original research proposal was approved by the OPTM Research Institute Ethics Committee, registered under the law of the land. Data were obtained under Institutional Review Board-approved consent form for the physical examinations, and radiological images required for the study and signed by all patients.

3. Results

3.1 *Enrolment of Patients:*

A total of 342 patients met the inclusion criteria and were enrolled. Finally, 180 patients were selected in the experimental group, and 162 were in the control group.

The mean age of populations in the group 40-60 years were 49.67 (±2.96) for women and 49.36 (±2.82) for men in the experimental group as against the control group, 46.65 (±2.70) and 47.95 (±3.25) respectively. The mean age populations in the group 60-80 years were 66.21 (±7.21) for women and 69.68 (±2.29) for men in the experimental group (control group: 68.24 (±4.58) years for women and 68.13 (±3.42) years for men).

3.2 *Biomechanics of Anthropometric indices:*

The biomechanics of anthropometric indices are classified into general and central obesity having different biomechanical and biochemical parameters to induce osteoarthritis shown in Figure 1.

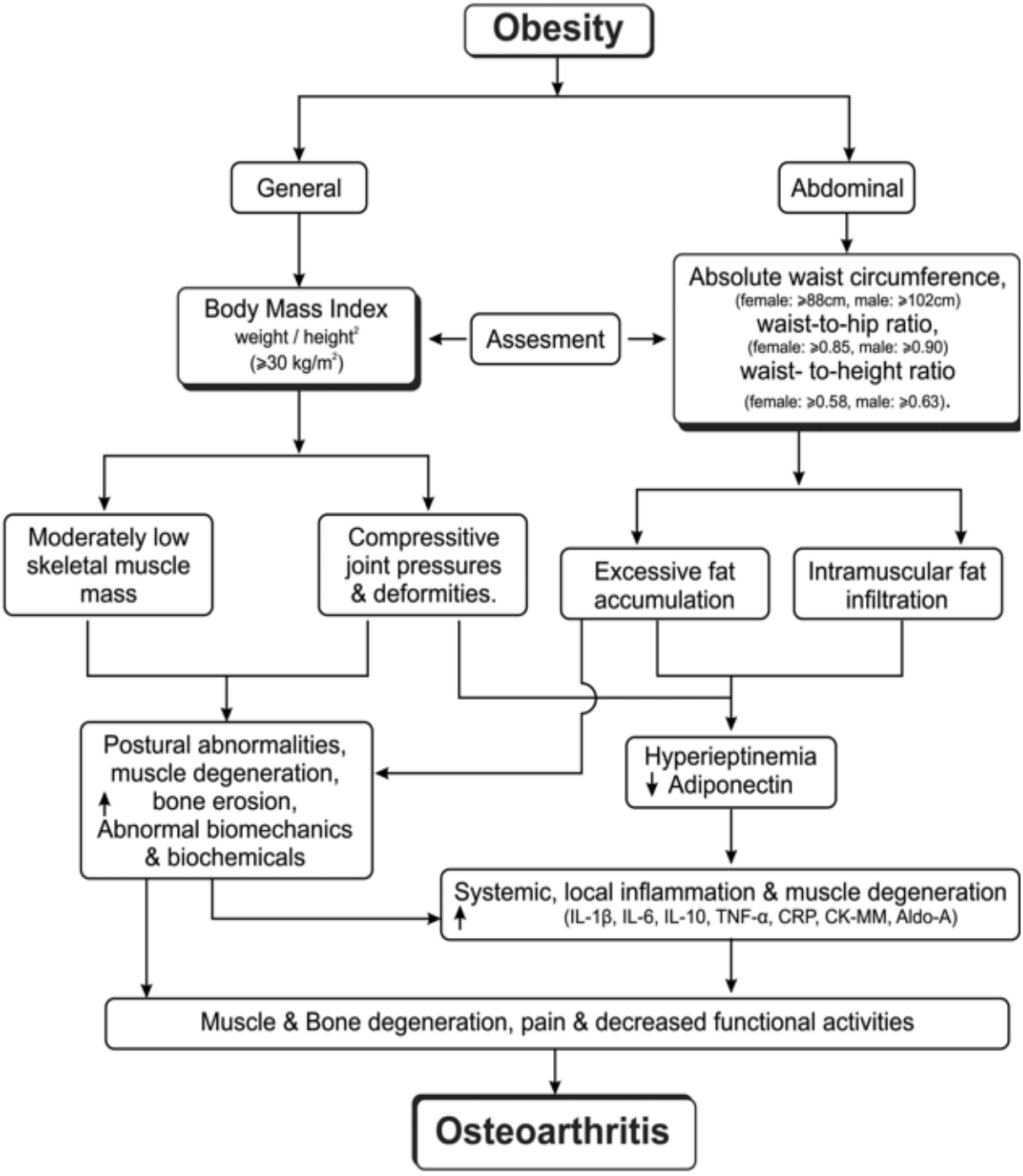


Figure 1: Potential obesity related pathways that contribute to osteoarthritis

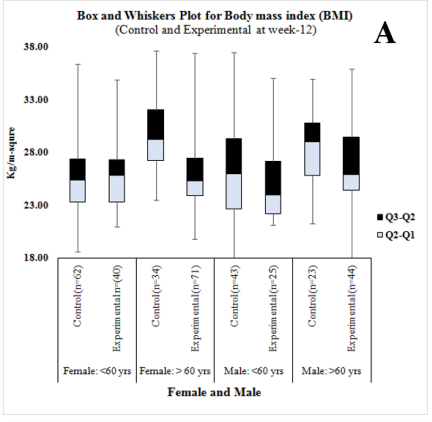
3.3 *Analyses of Anthropometric indices:*

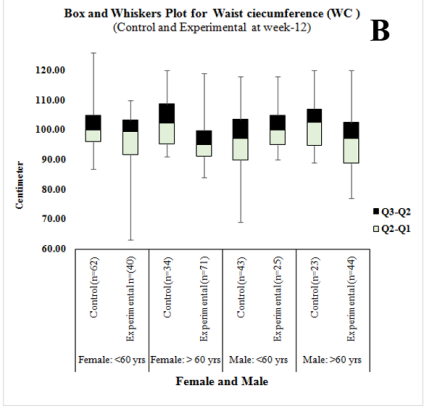
The analyses of the mean and standard deviation of anthropometric values of 162 control subjects and 180 experimental subjects at week-0 according to gender and their age groups of 40-60 and 60-80 was shown in Table 1

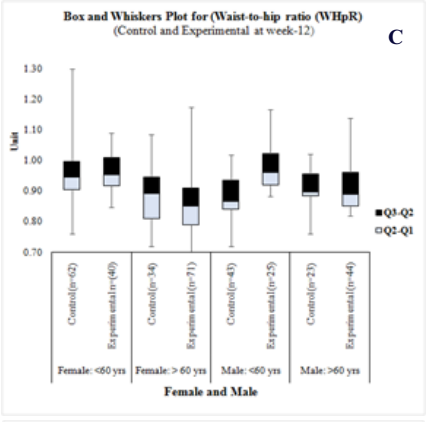
Age group (years)	Control group (n=162)			Experimental group (n=180)		
	Female-only (n=96) (59.26%)	Male-only (n=66) (40.74%)	p-value	Female-only (n=111) (61.67%)	Male-only (n=69)(38.33%)	p-value
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
Number of patient (n) (%)						
40-60	n=62 (64.58)	n=43 (65.15)		n=40 (36.04)	n=25 (36.23)	
60-80	n=34 (35.42)	n=23 (34.85)		n=71 (63.96)	n=44 (63.77)	
Average age: Mean (SD) years						
40-60	48.16 (5.90)	47.95 (4.73)	0.8466	49.68 (6.47)	49.36 (7.13)	0.8526
60-80	68.24 (5.83)	68.13 (5.88)	0.9447	68.50 (5.75)	69.68 (4.40)	0.2463
Weight (kg)						
40-60	72.00 (10.23)	77.23 (11.62)	0.0166	75.62 (8.95)	80.55 (10.64)	0.063
60-80	75.51 (9.84)	80.50 (9.09)	0.058	74.79 (11.02)	86.58 (12.60)	<0.0001
Height (cm)						
40-60	160.26 (7.26)	168.27 (5.18)	<0.0001	160.23 (5.41)	169.81 (6.17)	<0.0001
60-80	158.17 (6.19)	167.89 (4.76)	0.058	1.59.18 (7.21)	171.23 (4.28)	<0.0001
Waist circumference (WC) (cm)						
40-60	102.71 (7.44)	100.15 (11.33)	0.1651	103.87 (6.73)	104.96 (8.28)	0.5633
60-80	103.68 (8.45)	102.76 (9.52)	0.7031	103.61 (7.91)	107.32 (8.84	0.0212
Hip circumference (HC) (cm)						
40-60	107.40 (9.37	110.21 (14.38)	0.228	104.38 (6.76)	104.45 (9.72)	0.9728
60-80	116.03 (13.17)	112.61 (11.89)	0.3219	111.56 (10.57)	102.84 (8.77)	<0.0001
Body mass index (BMI) (kg/m2)						
40-60	28.26 (4.11)	28.74 (3.45)	0.5317	29.58 (3.80)	27.92 (3.38)	0.0789
60-80	30.30 (4.14)	27.17 (3.95)	0.0061	29.56 (4.23)	29.66 (4.35)	0.9032
Waist-to-hip ratio (WHpR)						
40-60	0.96 (0.09)	0.91 (0.06)	0.0019	1.00 (0.06)	1.01 (0.08)	0.5679
60-80	0.90 (0.08)	0.92 (0.06)	0.3124	0.93 (0.09)	1.05 (0.09)	<0.0001
Waist-to-height ratio (WHtR)						
40-60	0.64 (0.05)	0.60 (0.07)	0.0009	0.65 (0.05)	0.62 (0.05)	0.0217
60-80	0.66 (0.06)	0.61 (0.06)	0.002	0.65 (0.06)	0.63 (0.05)	0.0672

Table 1: Anthropometric values according to age and gender of participating subjects

Figure 2 shows the Box andWhiskerplot for analyses of control group (n=162) and experimental group (n=180) at week-12 according to age (less than and more than 60 years) and gender participating, wherein, it reveals that the values of all anthropometric parameters of the women participants (> 60years) were all noted to be highly effective in terms of skewness, interquartile range (IQR) and the respective medians of the patients in the experimental group compared to control group.







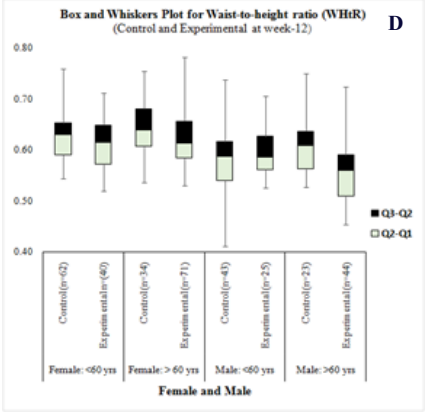
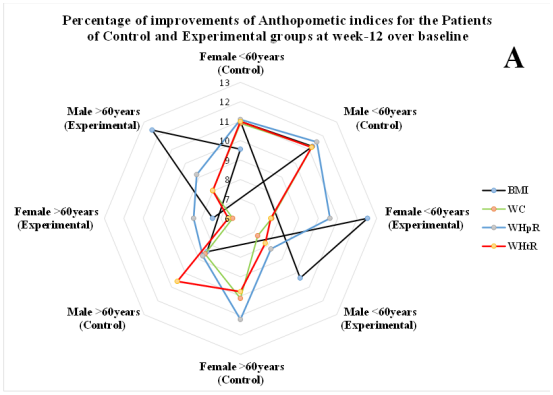
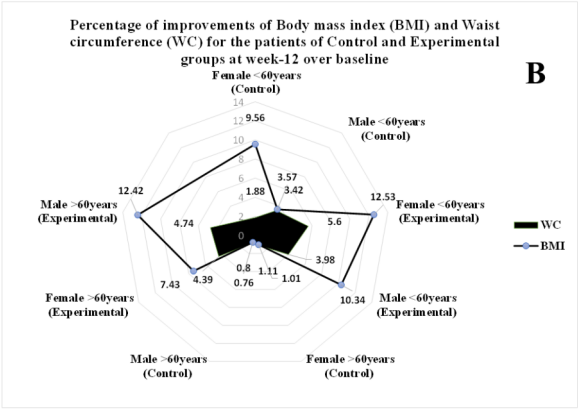


Figure 2: Whisker Plotting for analyses of control group (n=162) and experimental group (n=180) at week-12according to age (less than and more than 60 years) and gender

Radar charts for the percentage of improvements of Anthropometrics in control group (n=162) and experimental group (n=180) at week-12 over the baseline according to age (less than and more than 60 years)

and gender participating shows the higher developments so far as the patients treated with JNDS (Figure 3).





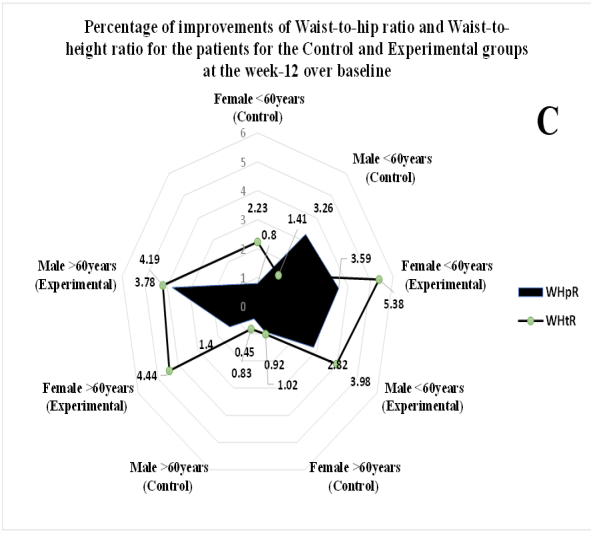


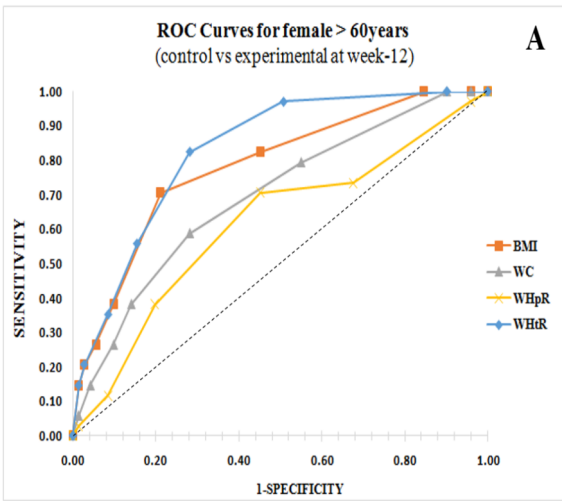
Figure 3: Radar chart showing the percentage of improvements of Body mass index (BMI), Waist circumference (WC),Waist-to-hip ratio (WHpR), and Waist-to-height ratio (WHtR) - **(A),** Body mass index (BMI) and Waist circumference (WC) – **(B)**, Waist-to-hip ratio (WHpR) and Waist-to-height ratio (WHtR) – **(C)**for the patients of Control and Experimental groupsat week-twelve over the baseline

The analysis of receiver operating characteristic (ROC) curves in respect of BMI, WC, WHpR and WHtR for 57 control subjects aged more the 60 years and 115 experimental subjects withall significant values of percentage of R-squares and their cut off points are shown in Table 2. The ROC curves for the anthropometric parameters for patients more than 60 years are depicted in Figure 4.

Table 2: Summary of Receiver operating characteristic (ROC) Curves of Anthropometric parameters of Experimental versus control groups at week-twelve

Anthropometric parameter	BMI (kg/m2)	WC (cm)	WHpR (unit)	WHtR (Unit)				
	Female	Male	Female	Male	Female	Male	Female	Male
Thresh hold value	≥ 30	≥ 30	≥ 88	≥ 102	≥0. 85	≥ 0.90	≥ 0.58	≥ 0.63
Cut off Point	28.89	27.39	94.9	102.9	0.89	0.88	0.61	0.55
(FPR, TPR)	(0.21, 0.71)	(0.39, 0.70)	(0.55, 0.79)	(0.34,0.52)	(0.45, 0.71)	(0.68,0.83)	(0.28,0.82)	(0.64, 0.87)
R-square (%)	85.01	89.12	93.05	94.64	95.42	97.57	76.63	93.33
AUC	0.855	0.781	0.782	0.713	0.712	0.629	0.88	0.755
Sensitivity (%)	70.6	69.6	79.4	52.2	70.6	82.6	82.4	87.01
Specificity (%)	78.90	61.4	45.1	65.9	54.9	31.8	71.8	36.4
Y	0.8750X +0.1486	0.8899X +0.1779	0.9405X +0.1486	0.9357X +0.1604	1.0117X +0.0571	1.125X +0.5590	0.9603X +0.2205	0.9671X +0.1392

BMI: Body mass index; **WC:** Waist circumference; **WHpR:** Waist-to-hip ratio; **WHtR:** Waist-to-height ratio; **FPR (1-specificity):** False positive rate; **TPR (Sensitivity):** True positive rate, **Y:** Linear line of regression; **AUC:** Area under the curve; **R-square**: Significance of accuracy.



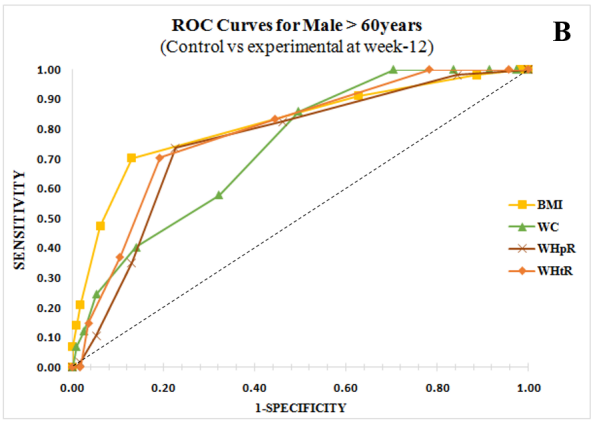


Figure 4: **(A)** Receiver Operating Characteristic curves for Body mass index (BMI), waist circumference (WC), waist-to-hip ratio (WHpR) and waist-to-height ratio (WHtR) of females having aged more than 60 years of control (n=34) and experimental (n=71) patients **(B)** Receiver Operating Characteristic curves for Body mass index (BMI), waist circumference (WC), waist-to-hip ratio (WHpR) and waist-to-height ratio (WHtR) of males having aged more than 60 years of control (n=23) and experimental (n=44) patientsparticipating.

3.4 *Improvements of Bone health as per Radiological Images as Assessed by Kellgren-Lawrence Grading Scale:*

Table 3 shows all the anterior-posterior (AP) views of the X-ray reports of 342 patients with KOA at the baseline exhibited degenerative changes, particularly in the medial tibiofemoral compartment, with marked joint space narrowing with osteophytes and bilateral varus/valgus deformities. The AP view of X-rays for bilateral knee joints of 180 patients after twelve weeks of treatment with JNDS indicated substantial improvements on degenerative changes as well as bone health as assessed under K-L grading scale upgraded between ≥2 and ≥3 especially for older patients' groups (60-80) both female and male and the balance of 162 patients treated with having further deterioration on bone health by 11%.

Table 3. Kellgren-Lawrence (KL) grading scale for knee-osteoarthritis of experimental subjects (n-180) and Control subjects (n=162) at baseline and week-12.

Knee joints	Gradation	Control Group				Experimental Group			
		Baseline		After 12-week		Baseline		After 12-week	
		Number	%	Number	%	Number	%	Number	%
KOA (Rt. knee)	Grade-0	None	None	None	None	None	None	None	None
	Grade-1	None	None	None	None	None	None	20	18.02
	Grade-2	None	None	None	None	None	None	58	52.25
	Grade-3	49	30.25	25	15.43	38	34.23	23	20.72
	Grade-4	113	69.75	137	84.57	142	65.77	10	9.01
KOA (Lt. knee)	Grade-0	None	None	None	None	None	None	None	None
	Grade-1	None	None	None	None	None	None	24	21.62
	Grade-2	None	None	None	None	None	None	62	55.86
	Grade-3	29	17.9	10	6.17	32	28.83	25	22.52
	Grade-4	133	82.1	152	93.83	148	71.17	None	None

KOA: *knee-osteoarthritis*

X-rays of two such patients suffering from pain in the knee joint before and after the treatment with JNDS and with dietetic protein with combined aerobic and resistance exercise therapy (DPARET) for 12-week were depicted in Figures 5.

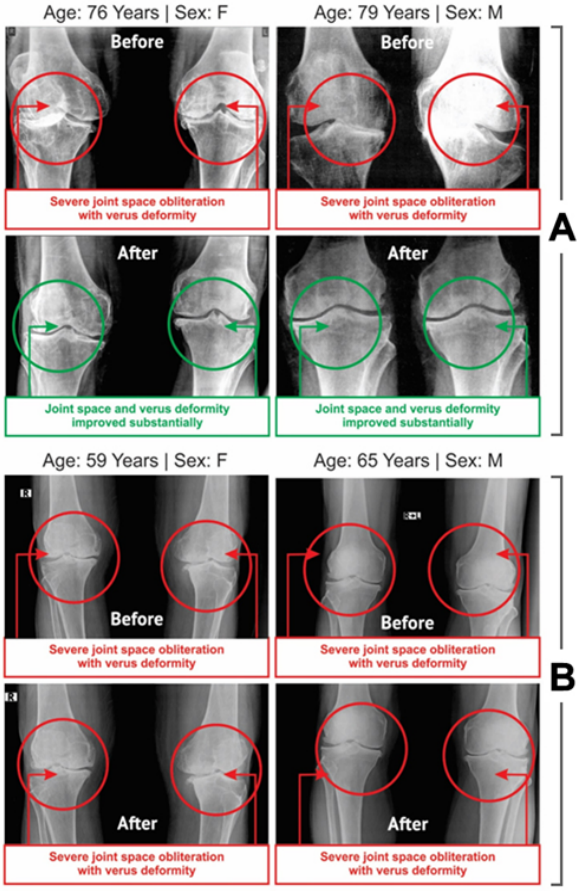


Figure 5. Radiological images of knee joints showing before and after treatment with Jumpstart Nutrition® Dietary Supplement (A) and with dietary protein food and exercise (B)

3.5 *Safety and Cost Evaluation.*

The topics of safety and tolerability were evaluated as per previous studies **[16-19].**

4. DISCUSSION

We believe that this is the first study reporting the prevalence of KOA risk factors in elderly persons by measuring anthropometric parameters such as BMI, WC, WHpR, and WHtR in major metropolitan cities in India. The current investigation reveals that these anthropometric indices may be more effectively regulated with JNDS compared to the current alternative treatment with DPARE.The study further addressed its question about the clinical usefulness of different anthropometric indices of both general and central obesity. It contributed to our understanding of the broad status of elders with KOA above 60 during Covid-19 pandemic in India.

Researchers have suggested that there is a close relationship between obesity (both general and central) and psychosocial factors such as depression, anxiety, stress, body dissatisfaction, binge-eating disorder, and impaired quality of life, including disability, particularly for women **[13,23].** While numerous pathways contribute to OA onset, obesity-specific mechanisms include relative loss of muscle mass and strength over time due to muscle degeneration, mechanical stress (especially during Covid-19 pandemic), and systemic inflammation. An inflammatory atmosphere occurs within tissues and joints due to the excessive compression of adipose tissue over the load-bearing joints. Figure 1briefly summarizes the proposed obesity-related mechanisms are underlying with KOA.

The present results show that the improvements of all anthropometric parameters during KOA are in higher sides in the average age group of 48.07±0.45 years in the pooled patients of the control group compared to the pooled patients of 49.56±0.85 years of the experimental group in the group 40-60 years. Still, these are in many unfavourable conditions at the average age of 68.19±0.79 years in the pooled patients of the control group compared to the pooled patients of 71.10 ±0.54 of the experimental group in the group 60-80 years. The reason may be the fact that the older people are not able to do any exercise due to their severe pain in the knee joints, and they cannot consume additional protein foods because of their other multiple health problems especially type-II diabetes.

The researchers have emphasized that the radar chart is a potentially effective tool that may be used to communicate value in health care and the study of the box and whisker plots are useful to understand the differential mechanisms of action of each treatment, and could help to explain the differences observed in clinical trials, meta-analyses and observational studies **[25-26]**

Therefore, from the results of the Radar chart and the box and whisker plots analyses, it may be considered that the treatment of KOA during COVID-19 with JNDS is more effective than the treatment with DPARET (Figures 2-3).

The ROC curve has many advantages in medical and /or biological sciences, as has been reported by many researchers**[24].**The analysis of ROC curves with their respective values of areas under the ROC curves, cut off points, and percentage of R-squares may be further predict the same phenomenon (Table 2 and Figure 4).

Several researchers have suggested that the modification of BMI thresholds in overweight and obesity needs amendment for the elderly population in chronic-degenerative diseases like KOA due to low quality of life, worse physical performance, and less physical well-being especially covid-19 pandemic situation **[27-28]**. Now, the fundamental question arose whether the central obesity (WC, WHpR, and WHtR) is useful measures for predicting disease risk of KOA with convincing evidence. Although most of the data were originating from populations of Indian descent habitats of major metropolitan cities, the association among these indices influenced the disease risk, as evidenced by diverse people. Waist circumference (WC), WHpR, and WHtR (abdominal obesity) established the correlations with BMI. Still, the level of association varied, suggesting that these measures may provide different information and thus may not be interchangeable. Practical considerations appeared to favour the use of WC as an alternative to BMI. For example, WC is suitable when measuring the waist is more comfortable and more accurate than measuring weight and height. Measuring hip circumference (HC) may be more complicated than measuring WC alone; this could highly potential use of WHpR and WHtR as an alternative to either WC solely or BMI. The present results indicate the same while calculating the factors in the comparison between the treatment with JNDS and protein food with different exercise programs. (Figures 2-3)

In these risk factors, general and central obesity is the most important and modifiable factors for KOA at old age [**5].** In this contest, the author has already elaborated in detail the functions of JNDS to overcome the modification factors of anthropometric parameters by ameliorating the calcium-to-phosphorus ratio and parathyroid hormone **[16].** And that to strengthening the skeletal muscle metabolism and function include inflammation, muscle degeneration, connective tissue damage, and bone erosion **[17];** and thus achieving symmetry of aberrant lower extremity and standardizing outcome measures **[18]** of older patients with KOA correlated with the Kellgren-Lawrence scale in the previous studies

Our present results show some credible improvements in reducing osteophytes, joint space narrowing, sclerosis, bony deformities of knee-joints of the OA patients treated with JNDS under the experimental group as assessed by the K-L grading scale. More numbers of patients of the experimental group have shifted to higher grades (grade 2 and grade 3) from grade 4 for both right and left knee joints with JNDS as against further deterioration of OA in the control group (Table 3 and Figure 5)

Although anthropometric methods, particularly WC, WHpR, and WHtR, compared to BMI for assessing the intensified status of KOA in older people is simple, inexpensive, and potentially reliable. However, the present study has several limitations. Firstly, this is a randomized controlled, designed study, with its inherent limited interpretation of cause-and-effect temporality. Secondly, as our study participants selected from major three metropolitan cities (West Bengal, Delhi, and Mumbai) in India, and therefore, our results may not be representative of other populations in urban districts in India. Thirdly, problems arise when evaluating older people with different Indian ethnic groups having disproportional heights, waist, and hip circumferences due to climatic-genetic conditions, as there is limited information to interpret anthropometric data in this age group. Based upon statistical definitions of threshold values of population studies have considered the reference values for the evaluation of such anthropometric indices in older adults. It is necessary to find all these factors to determine desirable threshold values for anthropometric measures in the elderly population in a particular region. Finally, the lack of anthropometric cross-sectional survey nationality in the elderly population in India limits the comparison of our gender and age-specific results. Therefore, the cohort research-based totally on exclusive ethnic communities required for meriting to verify our conclusion.

5. CONCLUSION

Our study suggests that anthropometric parameters (BMI, WC, WHtR, and WHpR) are detrimental factors to KOA (Figure 1). Our findings might indicate the use of JNDS as the best alternative compared to the modern treatment protocol includes a dietetic protein with combined high-intensity-aerobic and resistance exercise therapy mainly to control abnormal anthropometric parameters for hindering the development and progression of severe KOA especially in the current emergency of COVID-19 pandemic which have high negative impact on perceived stress and psychobiosocial states at the old age as assessed by the KL grading scale with radiological images (Table 3 and Figure 5).Therefore, effective strategies for preventing and controlling the epidemic of abdominal obesity are needed to diminish the adverse effects on public health to serve older people without surgical intervention for chronic KOA. Future studies should, therefore, control for a broader range of potential confounders, including dietary, socioeconomic, and biochemical measures, to elucidate the associations between anthropometric proxy measures and risk of KOA with the elimination of potential mediating and moderating factors.

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8. Conflicts of Interest: The author declares that there are no conflicts of interest regarding the present study.

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