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Obesity as a Risk Factor for Low Back Pain in a Nigerian Population

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Background: ***Various risk factors have been implicated in the etiology of Low back pain (LBP) and the role of obesity has remained contentious till date. The objective of this study was to determine if a relationship exists between obesity and low back pain, and to identify other risk factors.***
Methods: ***This is a case-referent study of patients that presented to the orthopedic clinic from June 2013 to June 2014. The cases were patients that presented with LBP during the period of this study, while the referents were randomly selected patients - without a diagnosis of LBP - that also attended the clinic at the same time. Body Mass Index was calculated and broadly classified into obese and non-obese. It was also further categorized using the WHO international classification. Independent t-tests and Chi-square tests were used to compare means and categorical variables respectively. A binary logistic regression analysis was carried out to determine independent risk factors.***
Results: ***A total of 332 patients were included in the study: 69.6% (n = 231) had LBP and 30.4% (n =101) did not. The mean BMI was 27.11kg/m² ± 4.1. Age, height and weight were statistically associated with LBP but gender was not. The relationship between obesity and LBP was null (OR 2.175 95% CI 0.914 – 5.177, p 0.079); however, at higher classes of obesity (BMI ≥35), the relationship was significant (p 0.000).***
Conclusion: ***Low back pain is a condition that is commoner in the elderly. Although obesity (BMI >30) was not identified as a risk factor, individuals with BMI≥35 are at increased risk. Age, height and weight were all significantly associated with LBP.***

Keywords: Low back pain, obesity, association, risk factor

Introduction

Low back pain (LBP) is a symptom of a wide array of conditions that include musculoskeletal as well as neurologic pathologies. Over the years, it has found increasing prevalence in both developing and developed countries.[1-3]With an estimated lifetime prevalence of 65 – 80%, it is one of the commonest reasons for clinic visits.[2,4-8]In Africa, its prevalence in adults is estimated at 50%.[2]In a study assessing its global burden in 2010, LBP was first in disability and 6th in overall burden with a DALY of $83M.[9] It therefore goes without saying that LBP is a condition with far reaching health and socioeconomic implications.[1-3,6,8,10]

Considering its burden, understanding the pathophysiology of LBP and its risk factors have been a major area of research. Obesity has been one of the main variables of interest. In recent times, there has been an increase in the global rate of obesity[3,6,7,11] and Africa has not been spared of this scourge. Identified as a risk factor for a number of diseases, it is measured using a variety of instruments. The Body Mass Index (BMI) is one of such tools. As an anthropometric tool, BMI was designed to determine weight adjusted for height but has also found use in estimating adiposity.[12-14]With the pathophysiology of LBP hinged on a complex interaction of psychosocial, biomechanical, and structural influences, obesity if present is believed to contribute to the interplay of these processes in the development of LBP.

Various pathways have been postulated to explain the role of adiposity in LBP development - metabolic dysfunction, mechanical stress and inflammation[2]. However, there has been varying results from scientific studies to support a relationship between obesity and LBP[15].This study aims to ascertain if obesity is a risk factor for LBP. It also intends to identify other risk factors in the development of low back pain.

Patients and Methods

This is a case-controlled study of patients that presented to the orthopedic outpatient from June 2013 to June 2014.This study was done at the Federal Medical Centre Owerri (FMCO) which is a tertiary healthcare institution in Imo state, Nigeria. FMCO serves as the major referral center for orthopedic cases in the state.At the time of this study, there were 3 orthopedic teams with 5 orthopedic surgeons in the center.

Inclusion Criteria: The cases were all patients that presented with LBP during the period of this study, while the referents were patients without LBP that also attended the orthopedic clinic at the same time. The referents were randomly selected. A total of 332 patients were included in the study: 231 had LBP and 101 did not.

Case Definition: Low Back Pain was defined as pain between the 12th of the ribs and the buttock crease.

Data Extraction: Patients' consents were obtained and demographic profiles collected. Weights and heights were measured in kilogram and meters respectively. Body Mass Index was calculated using the formula $BMI = \frac{wt(kg)}{ht^2}$.

Outcome Examined: BMI was classified into obese (BMI ≥30) and non-obese (BMI<30). It was further classified using the WHO international classification as underweight (BMI<18.5), normal weight (BMI 18.5 -24.9), overweight (BMI 25.0–29.9), Class I obesity (BMI 30.0–34.9), Class II obesity
(BMI 35.0 – 39.9) and Class III obesity (BMI ≥40).

Statistical Analysis: The data was analyzed using SPSS version 21. The distribution of categorical variables was represented in percentages while means and confidence intervals (CI) were used to represent ordinal and nominal variables. Means and categorical variables were compared using independent t-tests and chi-square tests. A p value < 0.05 was statistically significant. A binary logistic regression model using LBP as an outcome was generated and variables independently associated with LBP were identified. To determine the risk of LBP with obesity, a separate analysis was carried out using BMI as a categorical variable (obese/non-obese).

Results

A total of 332 patients were included in the study with 207 (62.4%) being females and 125 (37.6%) being males. The mean age of the study population was 57.8 years ± 14.1and the peak age in both genders was the 6th decade (Figure 1). The mean BMI of the study population was 27.11kg/m^2 ± 4.1 (95% CI 26.66 – 27.56). Overall mean weight and height were 79.4kg ± 9.57 (95% CI 78.4 – 80.4) and 1.72m± 0.076 (95% CI 1.71 – 1.72) respectively. In 101 (30.4%) of the patients, no low back pain was present while 231 (69.6%) had it. The average age for the control group was 62.9 years ± 13.91 and 55.8 years ± 13.68 for the case group. This difference between ages of both groups was statistically significant (t score -4.252, *p 0.000*). 24.8% and

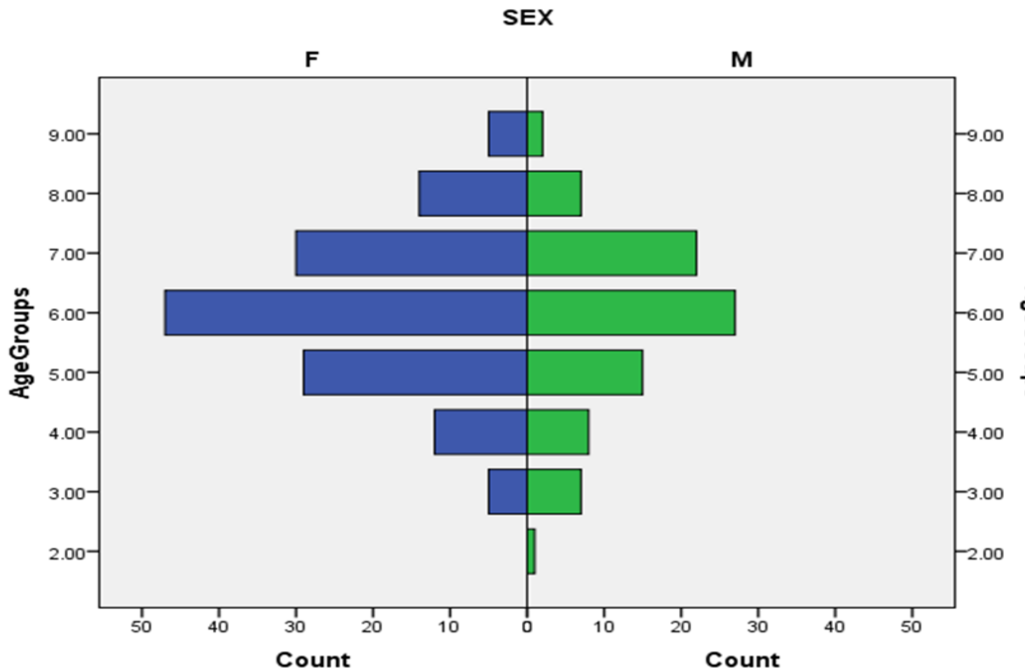

Figure 1. Gender Distribution in the various age groups

Table1. Demographic Characteristic of Patients

Characteristic	**Case Group**		**Referent Group**	
	Number	%	Number	%
Gender: Females	142	61.5	65	64.4
Males	89	38.5	36	35.6
Age Groups: 11 – 20 years	1	0.4	0	0.0
21 – 30 years	12	5.2	2	2.0
31 – 40 years	20	8.7	2	2.0
41 – 50 years	44	19.0	13	12.9
51 – 60 years	74	32.0	27	26.7
61 – 70 years	52	22.5	30	29.7
71 – 80 years	21	9.1	17	16.8
81 – 90 years	7	3.0	8	7.9
91 – 100 years	0	0.0	2	2.0
BMI Groups: Underweight	1	0.4	2	2.0
Normal Weight	64	22.7	33	32.7
Overweight	122	52.8	41	40.6
Obese	44	19.0	25	24.8

19% of the referent and case cohorts were obese, and the mean BMIs were 27.46kg/m^2± 5.23 and 27.05kg/m^2± 3.5 respectively. The mean weight for the case group was 80.07kg ± 8.53

while that for the control cohort was 77.86 kg ± 11.50. The characteristics of both groups are displayed in Table 1.

In the case cohort, the overall male-to-female ratio was 1.6:1. Males were however predominant in the 2nd and 3rd decades while females were dominant from the 4th till the 10th decade. Females had marginally higher mean weight(Females - 80.23kg ±8.92, males -79.83kg ± 7.91) and height (females - 172.84cm ±6.49 and males - 171.83cm ± 7.02) while males had slightly higher BMI (males - 27.16 ± 3.39 and females - 26.97 ± 3.63).These associations were null.60.9% (n = 42) of the obese cases were males and 39.1% (n = 27) were females. There was no significant relationship between obesity and gender (*p 0.776*).

Table 2a. Independent risk factors for the entire population irrespective of sex

Risk Factors	Odds Ratio	95% Confidence Interval	P value
Age	1.04	1.02 – 1.06	0.000
Gender	1.15	0.68 – 1.94	0.597
Height	1.34	1.09 – 1.65	0.005
Weight	0.67	0.53 – 0.84	0.001
BMI	3.00	1.54 – 5.83	0.001

Table 2b. Independent Risk Factors for Females

Risk Factors	Odds Ratio	95% Confidence Interval	P value
Age	1.04	1.01 – 1.07	0.003
Height	1.26	0.96 – 1.65	0.103
Weight	0.70	0.52 – 0.96	0.024
BMI	2.59	1.08 – 6.25	0.034

Table 2c. Independent Risk Factors for Males

Risk Factors	Odds Ratio	95% Confidence Interval	P value
Age	1.03	1.00 – 1.06	0.046
Height	1.45	1.06 – 2.00	0.022
Weight	0.62	0.43 – 0.89	0.010
BMI	3.60	1.28 – 10.17	0.016

To determine the independent factors association with LBP, a binary logistic regression analysis was performed, and a significant regression equation was found (*p 0.000*, $R^2 = 0.161$).Age, sex, weight, height and BMI were the variables included in the model. The Hosmer-Lemshow goodness of fit showed that the model fit the data (*p 0.193*). Age, weight, height and BMI were significantly associated with LBP (OR 1.04 95% CI 1.02 – 1.06, OR 0.665 95% CI 0.528 – 0.839, OR 1.34 95% CI 1.02 – 1.65 and OR 3.00 95% CI 1.54 – 5.83 respectively). The association between LBP and gender was null (OR 1.15 95% CI 0.68 – 1.947, *p 0.597*).After controlling for other factors, age, weight, and BMI but not heights were risk factors among women. Males, however, had age, weight, height and BMI as independent risk factors (Table 2).

With BMI classified either as obese or non-obese and included in a separate binary logistic regression model, obesity was not an independent risk factor (OR 2.175 95% CI 0.914 – 5.177, *p 0.079*). A similar pattern was also observed when the model was applied to the different genders with p values 0.056 and 0.0479 for the male and female cohorts respectively.

Discussion

During the period of this study, a total of 2132 patients visited the clinic. Since all the patients with low back pain were recruited, the prevalence was calculated as10%.This is lower than the 46.8% observed by Ogunbode et al in their hospital-based study in western Nigeria.[16]We found BMI to be independently associated with LBP in the entire population, as well as the gender subgroups. However, when categorized as obese or non-obese using the WHO cut-off point of 30, we found no significant relationship between obesity and low back pain (OR 2.175 95% CI 0.914 – 5.177, p 0.079). At a higher cut-off of 35 (Classes II and III obesity), a significant interaction was noted (OR 14.96 95% CI 3.753 – 59.658, p 0.000). Garzillo and Garzillo in 1994 had a similar result were an association was observed only in the upper 25th percent of obesity.[17]Although in agreement with studies that have shown increasing BMI as a risk factor for LBP,[1,18]our finding places this risk at values above the stipulated cut-off point for obesity. This variation could be attributed to the limitation in the use of BMI as it has been purported to give room for misclassification of overweight/obesity.[5]As BMI does not directly measure body fat, there is a drawback ineffectively accounting for very high muscle masses which can be misrepresented as obesity/overweight[14]. This limitation calls for the use of other instruments that directly measure adiposity [5,10,11].

In addition to obesity, we sought to identify other potential risk factors for LBP. One of the variables that we identified is age (OR 1.04 95% CI 1.02 – 1.07, *p 0.000*). More prevalent in the elderly, LBP is said to start at a younger age and increase in frequency and severity with age. One explanation for this high rate of LBP in the elderly have been attributed to the higher risk of degenerating disorders of the spine such as spondylosis in the older population[1, 8] . Although we had a significantly older cohort in the referent group, it did not nullify the effect of age as a risk factor on LBP. We, however, observed that the effect of age was lost in the moderate and severe obese subgroups.

Gender-based differences in LBP from our study revealed that although we had more females, the difference was not statistically different (OR 1.15 95% CI 0.68 – 1.947, *p 0.597*).This is similar to the finding by Kostova and Koleva [19]. A plausible reason for this gender variation is the health seeking habit of women. Women have been noted to seek healthcare for ailments more than men[20] and this could be the reason for the higher prevalence observed in our study. Furthermore, researches have shown that women are more likely to report pain than their male counterparts [21]. Overall, there has been no agreement on the role of gender in LBP as studies have yielded differing results[21.] Both sexes in our study had similar increase in prevalence with age reaching a peak at 51 – 60 years. Although there was a male case between 10 years and 20 years, the female cases started from age 20 years.

Literature on the association between height and LBP has shown a lot of controversies with most of the relationship being with disc herniation as a pathology[14, 21]. We did note a significant association between LBP and height (OR 1.34 95% CI 1.09 – 1.65, p 0.005). An attempt to identify risk factors unique to each gender revealed that in females, height was not a risk factor after adjusting for other variables.BMI and weight, however, were. Contrary to the observation that the association between obesity and LBP is higher in women[11], no relationship was noted in either sex in our study. Conversely, the risk of LBP with increasing BMI was higher in males than females. Weight, on the other hand, had a significant relationship with LBP in both genders, and the entire sample population. Leboeuf-Yde[22] had similar findings in her study in which she concluded that body weight should be considered a possible weak risk indicator.[22]On the other hand, Mortimer et al[23] failed to show a clear cut relationship between a high body weight and low back pain – showing a relationship in males but not in females[23].

A major challenge to determining a relationship between obesity and LBP is the obscurity in definition. As a symptom and not a disease, an attempt to link it to obesity might prove difficult due to the large number of possible etiologies – hence the variations in results from studies done. Interestingly, studies that have attempted to hone in on a particular diagnoses have also been faced with the same debate [6].

Limitations of Study: One of the limitations of this study is that it did not effectively seek out other confounding variables, such as physical activity or smoking which could account for the presence of LBP in the patients. These areas are aspects of the study that should be put into consideration in future studies. A population based study will also further elucidate the effect of LBP on the population, as a whole.

Conclusion

Low Back Pain is a condition that mostly plagues the elderly with majority of the patients in their 6th decade of life. Age, BMI, height and weight but not gender was found to be significant risk factors. Higher classes of obesity (BMI ≥35) were also identified as risks for developing LBP. The use of an encompassing term as "low Back Pain" should be avoided in further studies as the ambiguity associated with it might act as a confounding factor. Furthermore, additional research is needed to further identify the relationship between obesity and the various individual diagnoses responsible for low back pain. Other theories that examine the relationship between body fat and LBP should also be explored as this could be causal but in a reverse manner: an individual with bouts of low back pain may be prone to weight gain due to inactivity or inability to exercise thus increasing their BMI. Or, it might be a confounder for other variables that are responsible for the low back pain.

References

1. Manchikanti L, Singh V, Falco FJE, Benyamin RM, Hirsch JA. Epidemiology of Low back pain in Adults. *Neuromodulation* 2014; 17:3 – 10
2. Hu HY, Chen L, Wu CY, Chou YJ, Chen RC, Haung N. Association among low back pain, income, and body mass index in Taiwan. *The spine journal* 2013; 13:1521 – 1526
3. Garcia JBS, Hernandez-Castro JJ, Nunez RG, Pazos MAR, Aguirre JO, Jreige A, Delgado W, Serpentegui M, Berenguel M, Cantisani AF. Prevalence of Low Back Pain in Latin America: A systemic Literature Review. *Pain Physician* 2014;17:379 – 391
4. Daentzer D, Hohls T, Noll Christine. Has overweight any influence on the effectiveness of conservative treatment in patients with low back pain. *Eur Spine J* DOI 10.1007/s00586-014-3425-5

5. Brooks C, Siegler JC, Cheema BS, Marshall PWM. No relationship between body mass index and changes in pain and disability after exercise rehabilitation for patients with mild to moderate chronic low back pain. *Spine* 2013; 38:2190 – 2195
6. Samartz D, Karppinen J, Cheung JPY, Lotz J. Disk Degeneration and Low Back Pain: Are they fat-related conditions? *Global Spine J* 2013; 3:133 – 144
7. Cuesta-Vargas AI, Gonzalez-Sanchez M. Obesity effect on a multimodal physiotherapy program for low back pain suffers: patient reported outcome. *Journal of Occupational Medicine and Toxicology* 2013; 8:13
8. Abanobi OC, Ayeni GO, Ezeugwu CC, Ayeni OA.Effects of socio-demographic characteristics on low back pain occurrence and smoking habit of welders/panel beaters in Owerri, south-east Nigeria. *Wudpecker Journal of Medical Sciences* 2014; 3(1):8 - 14
9. Hoy D, March L, Brooks P, Blyth F, Woolf A, Bain C, Williams G, Smith E, Vos T, Barendregt J, Murray C, Burstein R, Buchbinder R: The global burden of low back pain: estimates from the Global Burden of Disease 2010 study. *Ann Rheum Dis* 2014;73:968-974
10. Shiri R, Solovieva S, Husgafvel-Pursianen K, Telama R, Yang X, Viikari J, Raitakari OT,Viikari-Juntura E. The role of obesity and physical activity in non-specific and radiating low back pain: The young Finns study. *Semin Arthritis* 42:640 - 650
11. Arranz LI, Ragecas M, Alegre C. Effects of Obesity on function and Quality of Life in chronic pain conditions*. CurrRheumatol Rep* 2014:390 DOI 10.1007/s11926-0130390-7
12. Flegal KM, Shepherd JA, Looker AC, Graubard BI, Borrud LG, Ogden CL, Harris TB, Everhart JE, Schenker N: Comparisons of percentage body fat, body mass index, waist circumference, and waist-stature ratio in adults. *Am J ClinNutr* 2009; 89:500–8.
13. Luke A, Durazo-Arvizu R, Rotimi C, Prewitt TE, Forrester T, Wilks R, Ogunbiyi OJ, Schoeller DA, McGee D, Cooper RS: Relation between Body Mass Index and Body Fat in Black Population Samples from Nigeria, Jamaica, and the United States. *Am J Epidermol* 1997; 145:620 – 8
14. Han TS, Schouten JS, Lean MEJ, Seidell JC: The prevalence of low back pain and associations with body fatness, fat distribution and height. *Int J ObesRelatMetabDisord* 1997; 21:600-607.
15. Skinner HB: Current Diagnosis & Treatment in Orthopedics. Lange Medical Books. New York; 200
16. Adetola M. OgunbodeAM, Adebusoye LA, Alonge TO. Prevalence of low back pain and associated risk factors amongst adult patients presenting to a Nigerian family practice clinic, a hospital-based study.*Afr J Prm Health Care Fam Med*. 2013; 5(1), Art.# 441, 8 pages. http://dx.doi.org/10.4102/phcfm.v5i1.441.
17. Garzillo MJ, Garzillo TA: Does obesity cause low back pain? *J Manipulative PhysiolTher* 1994, 17:601-4.
18. Smuck M, Kao MCJ, Brar N, Martinez-Ith A, Choi J, Tomkins-Lane CC. Does physical activity influence the relationship between low back pain and obesity? *The Spine J* 2014;14:209 – 216.
19. Kostova V, Koleva M: Back disorders (low back pain, cervicobrachial and lumbosacral radicular syndromes) and some related risk factors. *J NeurolSci* 2001; 192:17-25.
20. Tudiver F, Talbot Y: Why don't men seek help? Family physicians' perspective on the help-seeking behavior in men. *J FamPract* 1999 Jan; 48(1): 47 - 52
21. Manchikanti L: Epidermiology of Low Back Pain. Pain Physician 2000; 3(2):167 – 192
22. Leboeuf-Yde C: Body weight and low back pain. A systematic literature review of 56 journal articles reporting on 65 epidemiologic studies*. Spine* 2000; 25:226-37.
23. Mortimer M, Wiktorin C, Pernol G, Svensson H, Vingard E, MUSIC-Norrtalje study group. Musculoskeletal Intervention Center: Sports activities, body weight and smoking in relation to low-back pain: a population-based case-referent study. *Scand J Med Sci Sports* 2001; 11:178-84.