

An Empirical Investigation of the Prevalence of Osteoarthritis in South West Nigeria: A Population-Based Study

<https://doi.org/10.3991/ijoe.v16i01.11554>

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Abstract—Today, Osteoarthritis remains the most prevalent chronic joint disease and a potentially incapacitating joint illness. It is an enduring health problem which cannot be cure though it can be managed. Osteoarthritis remains a serious public health problem because its burden is high, people who live with it have a greater risk of developing anxiety / or depression and if it is not properly managed, it can bring about disability as well as impairing quality of life. This paper presents a statistical correlation between the reported risk factors of Osteoarthritis and its prevalence in Nigeria. Statistical tests were performed to investigate if there is enough evidence for inferring that the risk factors for Osteoarthritis are true for the whole of Nigerian population.

Keywords—Osteoarthritis, Prevalence, Risk factors, Disability, Quality of life

1 Introduction

Osteoarthritis (OA) is known to be a degenerative joint disease of global public health importance. It is the most frequent musculoskeletal disorder associated with aging worldwide [1, 2, 3]. Pain is the major symptom experienced by most people who are living with OA [4, 5, 6,7]. OA is the end result of a damaged or lost articular cartilage. When the articular cartilage, which reduces friction between bones and also acts as shock, is broken down, it results in OA. The articular cartilage makes the movement of bones at their meeting point (joints) easier, thereby providing support and flexibility of joints [8]. It is a cushion, naturally place at the joint surface, which prevents two bones from rubbing each other at the point where they meet. However, when the cushion breaks down or damages, the underlying bones begin to rub each other and slowly wear and tear thereby causing pain, stiffness, swelling, restriction of movements in the attacked joint, to the extent that people affected may find it very

difficult to carry out their daily tasks, and if not managed properly, they may not be productive any longer. In United States alone, over 30 million persons are living with OA, also it has been reported to be the leading cause of permanent disability among her elderly population [9]. OA also causes reduced function and disability; some people are no more productive, that is, they are no longer able to carry out their daily tasks or jobs. OA was adjudged to be a chronic musculoskeletal condition accountable for limited activity (particularly walking), reduced participation and impaired quality of life (QoL) [10]. OA is a national tragedy because it imposes a huge financial burden through wage loss along with the cost of medications [11]. In addition, it has severely endangered the lives and livelihoods of many people worldwide [12] thereby causing impaired QoL [13]. This tragedy is exacerbated owing to the fact that no permanent treatment exists currently for OA, the available therapy only seeks to relieve symptoms, improve joint mobility and function, and improving the QoL of individual living with it [13, 14, 15]. To this end, there is a need to create awareness in Nigeria that OA being a serious public health problem, if not properly managed can lead to permanent disability, and to publish the various ways through which it can be prevented with the aim of aiding policy making. In this paper, effortful attempt has been made to investigate the relationship between prevalence of OA and its root risk factors amongst Nigerians and to create appropriate awareness for this QoL threatening syndrome.

1.1 Epidemiology of osteoarthritis

Osteoarthritis is the most common type of arthritis. It is often caused by wear and tear on a joint over a lifetime. It is mostly found in knee, spine, hip and hand [16]. OA causes cartilage to undergo a slow damage due to stiffness developed by losing the elasticity, thereby causing gradual erosion. This erosion causes ligaments to experience stretching that initiates the pain, therefore, it no longer can act as a proper shock absorber. The outcome is that the bones start rubbing with each other adding agony and suffering. Initially, the symptoms advance slowly but worsens with time causing inflammation and creating more harm to the joint. Patients feel pain during and after the joint- movement. There is an aching sensation at the joints if the patient tries to move suddenly which usually occurs when patients wake up in the morning. In most cases the development of stiffness is a common indication [17]. It has been ascertained that the disease advances with age [2, 18, 19]. Along with its progression, patients lose flexibility and feel irritating sensation while flexing the joints. As a symptom, hard lumps or bone spikes appear at the joints under attack [20]. OA, though most often found in the knees, is also found in the hands, hips and spine foot [21]. OA is an enduring illness, though it can be managed but do not have a permanent cure as such not everybody living with OA reports its incidence in the hospital.

1.2 Clinical characteristics of osteoarthritis

Osteoarthritis can damage any joint in the human body; however, its occurrence is common in “usage-related” joints, especially, the, knees, hips, spine and hands. The

most common symptoms of OA are morning stiffness, usage-related pain, and restriction of locomotors [22]. As stated earlier OA is a progressive disease. The clinical features of OA vary from early stage to the advanced stage. These features may include: short-lived morning stiffness, restriction of locomotors, loss of flexibility, grating sensation and pain at extremes of movement in early stage. More severe OA is characterized by enlargement of bone, crepitus and reduced range of movement while rest pain, night pain, muscle wasting, bone spur and deformity suggest advanced OA. Symptoms and signs of swelling or inflammation are very rare in people living with OA unlike other forms of arthritis.

1.3 Risk factors of osteoarthritis

Some risk factors of OA are socio-demographic related (age, gender, and occupation), obesity, genetics and previous injury. It was affirmed that with aging, OA is inevitable, as its prevalence increases amongst the aged population of developing and developed countries. As such, age is considered one of the primary risk factors of OA [3, 17, 23, 24, 25]. Several studies have reported that gender is an important factor to be mentioned in the discourse of incidence of OA. OA is more prevalent in females than in their male counterparts [21, 26, 27]. Genetic factor has been considered a very strong risk factor of OA [27, 29]. It has been reported that family history is also a powerful contributing factor of OA [29, 30]. However, there is substantial correlation between genetics and OA [31]. History of joint injury is another risk factor of OA. Previous joint injury could be from a fall, a vehicle accident, military injury, sport or any form of physical injury to a joint. Subjects who have one time or the other experience joint injury are more likely to develop OA [32]. Previous studies showed that persons whose occupations involve extreme pressure and joint activity are likely to develop OA [30, 12]. Daily lifting and carrying of loads are strong determinants of KOA. Individuals whose physical work load are heavy or include regular climbing of stairs, kneeling, crawling, bending and rhythmic movement are liable to develop OA [33]. However, the fact that individuals who are obese (i.e. whose BMI > 29.9kg/m²) are at greater risk of developing KOA [34]. Obesity is a clear risk for developing OA because it overwhelms the joints, such as the knee, with increased load, which in turn increases stress and could possibly speed up the breakdown of the joint cartilage [35].

2 Materials and Methods

In this study, social survey was carried out to obtain relevant information regarding the awareness and prevalence of OA from respondents. Questionnaire was the research instrument used to gather statistically useful information regarding the subject matter because with it, it is relatively easy, fast and economical to reach large number of people. A pool of 30 semi-structured questions was developed. The questionnaire was divided into three sections, namely: Demographic and social characteristics of the Respondents, Symptoms of OA, and Treatment and Medication of OA. Experts (Rheumatologists and Physiotherapist) and several lay persons were asked to appraise

the questions for face validity, breadth of coverage and content validity. One thousand eight hundred (1800) questionnaires were personally administered to Nigerians aged eighteen (18) and above, from different walks of life. The study was carried out in the urban and rural areas of South West Nigeria (which comprises six states namely: Ekiti, Lagos, Ogun, Ondo, Osun and Oyo) between January 2018 and February 2019.

Six research hypotheses were formulated and tested to establish whether or not there is a significant relationship between risk factors and incidence of OA. The major risk factors of OA have been reported to include socio-demographic characteristics (age, gender and occupation), genetics, body mass index (BMI), and previous joint injury [21,24]. BMI is the value got from the height and weight of an individual; it is calculated by dividing weight in kilograms (kg) by the square of height in metres (m), universally expressed as kg/m². Statistical Package for Social Sciences (SPSS) for windows was used for data analysis, chi-square test was employed to analyze data and test the association between each of the risk factors and incidence of OA. The correlation coefficient (r) was also calculated in order to determine the strength of the relationship between each of the risk factors and OA prevalence. Descriptive analysis, which produces frequency tables and charts that displayed both the numbers and percentages of cases for each observed value of variables, was also carried out.

2.1 Research hypotheses

A hypothesis is referred to as a mere assumption based on inadequate proof that needs further investigation and experiment in order to be proved or disproved. To ascertain whether a hypothesis is true or false, it must be subjected to further testing. Testing a hypothesis begins by taking two hypotheses called the null hypothesis and the alternative hypothesis into consideration. These hypotheses include conflicting perspectives.

In this paper we formulate six hypotheses to test whether there are significant relationships between the risk factors of OA and its prevalence.

Hypothesis 1: H₀: No statistically-significant relationship exists between age and the incidence of OA

H₁: A statistically-significant relationship does exist between age and the incidence of OA

Hypothesis 2: H₀: No statistically-significant relationship exists between occupation and incidence of OA

H₁: A statistically-significant relationship does exist between occupation and the incidence of OA

Hypothesis 3: H₀: No statistically-significant relationship exists between gender and the incidence of OA

H₁: A statistically-significant relationship does exist between gender and the incidence of OA

Hypothesis 4: H₀: No statistically-significant relationship exists between previous joint injury and the incidence of OA

H₁: A statistically-significant relationship does exist between previous joint injury and the incidence of OA

Hypothesis 5: H₀: No statistically-significant relationship exists between BMI and the incidence of OA

H₁: A statistically-significant relationship does exist between BMI and the incidence of OA

Hypothesis 6: H₀: No statistically-significant relationship exists between genetics and the incidence of OA

H₁: A statistically-significant relationship does exist between genetics and the incidence of OA.

2.2 Criteria for acceptance and rejection of hypothesis

In this study the decisive factors used either to accept or to reject the null hypothesis are as follows:

If $\chi^2_{cal} > \chi^2_{tab}$, the null hypothesis is rejected otherwise the null hypothesis is accepted

If $p \leq \alpha$, the null hypothesis is rejected, otherwise it is accepted

Where α is the level of significance which is set to be 0.05 ($\alpha=0.05$) and p is the probability that indicate the strength of evidence for a null hypothesis.

3 Results and Discussion

This section discusses the results obtained from this study.

3.1 Socio demographic characteristics of the respondents

A total of 1800 questionnaires were administered. Only 1520 consisting 700 males (46.1%) and 820 females (53.6%) questionnaire were analyzed, the remaining ones (280) were either incomplete or not returned. Table 1 shows the socio-demographic characteristics of the respondents. Age distribution of the respondents showed the lowest fraction, 278 (18.3%) in the above 60years' age group while in the occupation-wise distribution of the respondents, trader/craftsman/farmer has the highest fraction 296 (19.5%).

Table 1. Respondents Socio-demographic characteristics (n=1520)

Socio-demographic Characteristic	Number (%)
<i>Gender</i>	
Male	700 (46.1)
Female	820 (53.9)
<i>Age Group (years)</i>	
18-30	290 (19.1)
31-40	300 (19.7)
41-50	325 (21.4)
51-60	327 (21.5)
Above 60	278 (18.3)

<i>Respondents</i>	
Professional	229 (15.1)
Technician and Manual	268 (17.6)
Trader / craftsman / Farmer	296 (19.5)
Housewife / unemployed	203(13.4)
Retiree	271 (17.8)
Students	253 (16.6)

3.2 Prevalence of osteoarthritis

Table 2 showed the prevalence of OA. It can be seen from the table that a larger percentage (67.1%) of Nigerian population is living with OA with 50.6% males and 81.2%. This shows that prevalence of OA is higher among females than males as clearly illustrated in Figure 1. Considering the age distribution of the respondents (see Table 2), it can be seen that oldest population, adults whose age > 60 years (96.0%) are mostly plagued with OA (see Fig. 2). This correlates with the work of reported in [17] where age was reported to be the most prominent risk factor for OA.

Table 2. Prevalence of Osteoarthritis by Risk Factors

Risk Factors	No. of Respondent Sur-veyed	Individual with Osteoarthritis	Prevalence (%)
<i>Gender</i>			
Male	700	354	50.6
Female	820	666	81.2
Total	1520	1020	61.7
<i>Age (years)</i>			
18-30	290	68	23.4
31-40	300	98	32.7
41-50	325	280	86.2
51-60	327	307	93.9
Above 60	278	267	96.0
Total	1520	1020	67.1
<i>Respondents</i>			
<i>Occupation</i>			
Professionals	229	189	82.5
Technicians/Manual	268	243	90.7
Traders/ Craftsmen/Farmers	296	253	85.5
Housewives/Unemployed	203	101	49.8
Retirees	271	181	66.8
Students	253	53	20.9
Total	1520	1020	67.1
<i>BMI (kg/m²)</i>			
Underweight: < 18.5	335	189	56.4
Normal weight: 18.0 –24.9	398	258	64.8
Overweight: 25.0–29.9	361	247	68.4
Class I Obesity: 30.0–34.9	239	178	74.5
Class II Obesity: 35.0–39.9	122	95	77.9

Class III Obesity: ≥ 40.0	65	53	81.5
	1520	1020	67.1
History of OA/Hereditary			
Yes	305	265	86.9
No	1215	755	62.1
Total	1520	1020	61.7
Previous Injury			
Yes	323	288	89.2
No	1197	732	61.2
	1520	1020	61.7

*Obtained by dividing the weight (kg) of the Respondent by the square of his/her height (m)

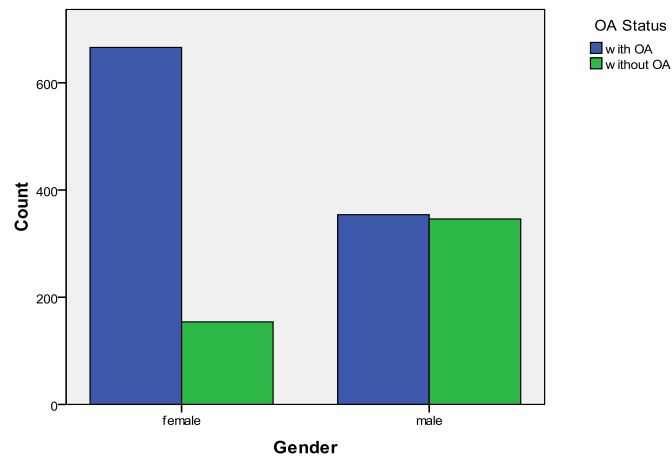


Fig. 1. Osteoarthritis Status by Gender

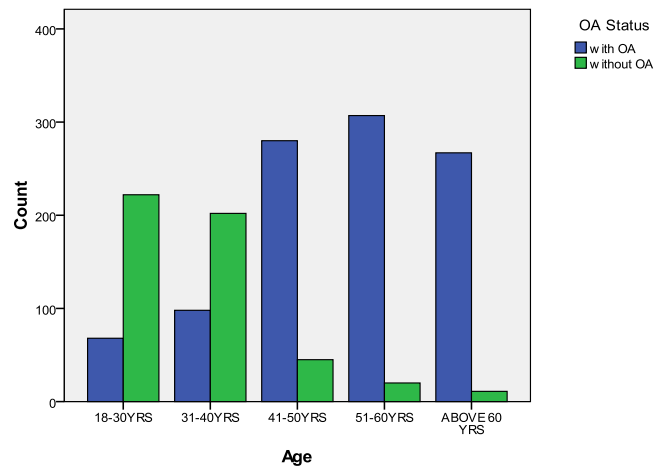


Fig. 2. Osteoarthritis Status by Age

From Table 2, Occupation distribution shows that prevalence of OA is not that pronounced among housewives/unemployed and students (49.8% and 20.9% respectively). This shows that OA is prevalent among the employed population. 86.9% of those who have history of OA in their families are actually living with OA; this indicates that OA is more prevalence among people who have history of OA in their families as seen in Fig. 3. This indicates that hereditary is also one of the key factors of OA.

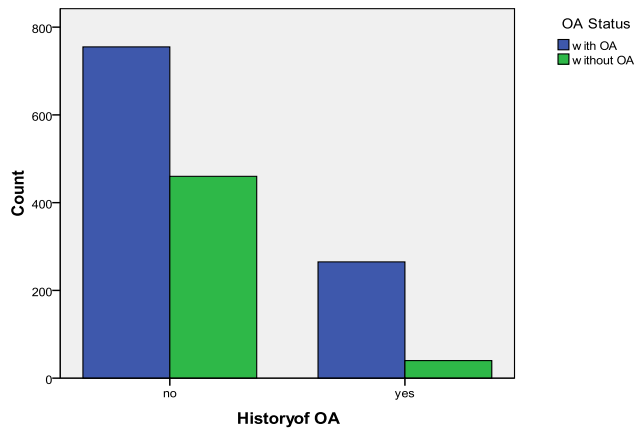


Fig. 3. Osteoarthritis Status by Hereditary

In the like manner, 89.2% of the people who had experience previous injury are living with OA as illustrated in both Table 2 and Fig. 4; this makes previous injury a key risk factor for Osteoarthritis.

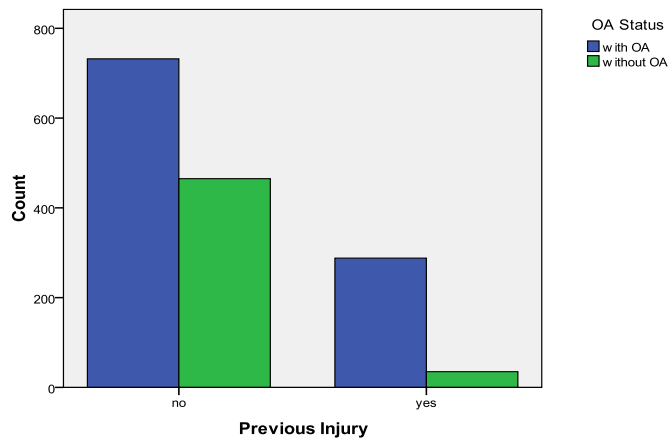


Fig. 4. Osteoarthritis Status by Previous Injury

The study shows that respondents who are obese (Class I, Class II or Class III) are more plagued with OA than individual respondents who are underweight, have normal weight or who are overweight this can be seen in both Table 2 and Fig. 5.

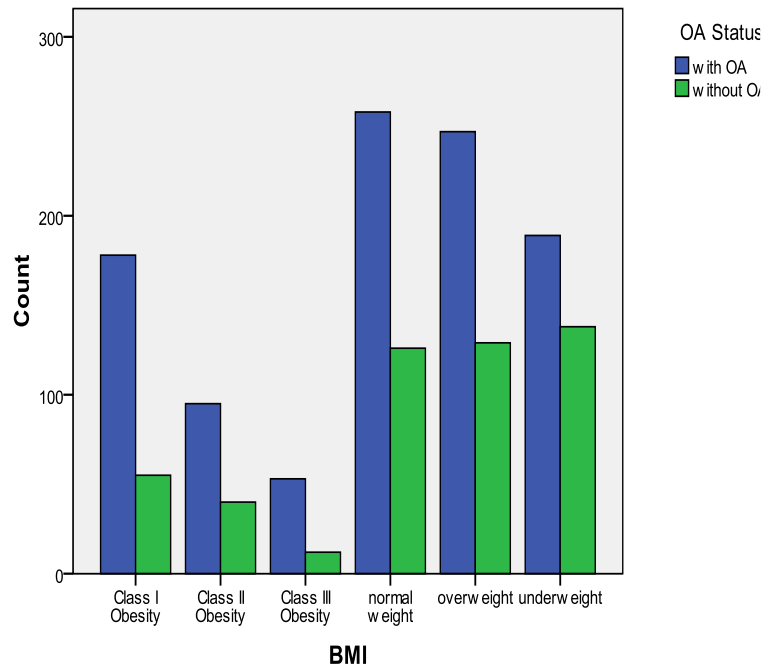


Fig. 5. Osteoarthritis Status by BMI

3.3 Test of correlation between socio-demographic variables and prevalence of osteoarthritis

Result of the test of correlation between socio-demographic characteristics (age, gender and occupation) and prevalence of OA is presented in Table 3. The result shows that there is a positive and strong correlation between age and prevalence of OA ($r = 0.67$), positive and moderate relationship between occupation and prevalence of OA ($r = 0.52$) while gender has a positive and weak relationship with OA ($r = 0.33$). The results of chi-square test on the significance of association between these socio-demographic variables and OA prevalence showed that there are sufficient evidences to conclude that there is significant relationship between them. For these variables, $\chi^2_{cal} > \chi^2_{tab}$, $p = 0.000$, this mean $p < \alpha$ which is set at 0.05 significant level.

3.4 Test of correlation between other risk factors and prevalence of osteoarthritis

Apart from social-demographic variables, previous injury, heredity and BMI have been reported to be risk factors for OA. The result of test of correlation carried out separately between BMI, previous injury and heredity, and prevalent of OA are presented Tables 4, 5 and 6 respectively. Tables 4, 5, 6 revealed that history of previous injury, hereditary and BMI correlates with prevalence of OA ($r = 0.24, 0.21$ and 0.14 respectively). In the like manner, it can be concluded from tables 4, 5, 6 that significant relationships exist between prevalence of OA and each of the risk factors ($p = 0.000$ from the Tables). The results of chi-square test on the significance of association between these risk factors and OA prevalence showed that there are sufficient evidences to conclude that there is a significant relationship between them. For these variables, $\chi^2_{cal} > \chi^2_{tab}$, $p = 0.000$, this mean $p < \alpha$ which is set at 0.05 significant level. There is strong evidence that all the null hypotheses are invalid.

Table 3. Association between Socio-demographic Characteristics and the Prevalence of Osteoarthritis

Socio-demographic characteristics	Number (%)			df	*r	χ^2_{cal}	χ^2_{tab}	P
	Yes	No	Total					
Male	354(50.6)	346(49.4)	700(100)	1	0.33	160.69	3.84	0.000
Female	666(81.2)	154(18.8)	820(100)					
Total	1020(67.1)	500(32.9)	1520(100)					
18-30	68(23.4)	222(76.6)	290(100)	4	0.67	676.69	9.49	0.000
31-40	98(32.7)	202(67.3)	300(100)					
41-50	280(86.2)	45(13.8)	325(100)					
51-60	307(93.9)	20(6.1)	327(100)					
Above 60	267(96.0)	11(4.0)	278(100)					
Total	1020(67.1)	500(32.9)	1520(100)					
Professional	189(82.5)	40(17.5)	229(100)	5	0.52	409.24	11.07	0.000
Technician/Manual	243(90.7)	25(9.3)	268(100)					
Trader/ Craftsman/Farmer	253(85.5)	43(14.5)	296(100)					
Housewife/ Unemployed	101(49.8)	102(50.2)	203(100)					
Retiree	181(66.8)	90(33.2)	271(100)					
Student	53(20.9)	200(79.1)	253(100)					
Total	1020(67.1)	500(32.9)	1520(100)					

Table 4. Association between Previous Injury and the Prevalence of Osteoarthritis

Previous Injury	Number (%)			df	*r	χ^2_{cal}	χ^2_{tab}	P
	Yes	No	Total					
Yes	288(89.2)	35(10.8)	323(100)	1	0.24	90.41	3.84	0.000
No	732(61.2)	465(38.8)	1197(100)					
Total	1020(67.1)	500(32.9)	1520(100)					

Table 5. Association between Hereditary and the Prevalence of Osteoarthritis

History of Osteoarthritis	Number (%)			df	*r	χ^2_{cal}	χ^2_{tab}	P
	Yes	No	Total					
Yes	265(86.9)	40(13.1)	305(100)	1	0.21	67.63	3.84	0.000
No	755(62.1)	460(37.9)	1215(100)					
Total	1020(67.1)	500(32.9)	1520(100)					

Table 6. Association between BMI and the Prevalence of Osteoarthritis

BMI (kg/m ²)	Number (%)			df	*r	χ^2_{cal}	χ^2_{tab}	P
	Yes	No	Total					
Underweight	189(56.4)	138(43.6)	335(100)	5	0.14	29.07	11.07	0.000
Normal weight	258(64.4)	126(35.2)	398(100)					
Overweight	247(68.4)	129(31.6)	361(100)					
Class I Obesity	178(74.5)	55(25.5)	239(100)					
Class II Obesity	95(77.9)	40(22.1)	122(100)					
Class III Obesity	53(81.5)	12(18.5)	65(100)					
Total	1020(67.1)	500(32.9)	1520(100)					

*Is the correlation coefficient

3.5 Forms and degree of osteoarthritis pain reported by respondents

Different people are living with different form of OA. As mentioned earlier, OA affects joints like knees hands, hips and spine. Table 7 indicates the forms and degree of OA pain reported by the population of people living with OA.

Table 7. Forms and Degree of Osteoarthritis Pain Reported by Respondents (n=1120)

Joint Affected	Never	mild	moderate	severe	Very Severe	**Total Affected
Knee	11.80%	24.50%	18.50%	21.60%	23.60%	88.20%
Hand	35.30%	18.80%	22.80%	15.10%	8.00%	64.70%
Hip	72.00%	15.40%	10.90%	1.00%	0.70%	28.00%
Spine	23.60%	18.50%	19.90%	20.40%	17.60%	76.40%
*Other	88.80%	6.40%	3.60%	0.90%	0.30%	11.20%

*Ankle, foot and Finger are included

**Never excluded

4 Conclusion

An empirical investigation into the prevalence of Osteoarthritis in south western states of Nigeria has been reported in this article. Among the 1800 questionnaires administered, only 1520 consisting of 700 males and 820 females were returned. The analysis carried out revealed that osteoarthritis is prevalent in south western states of Nigeria. 50.6% of the victims were males while 81.2% were females, this showed that

osteoarthritis is more prevalent in females than males. Furthermore, 96% of the victims are above 60 years of age. This further showed that age is the greatest risk factor of osteoarthritis followed by occupation while BMI is the least. This correlate with the results reported in [1, 2, 3,10] where age was reported to be the most prominent risk factor for osteoarthritis. Other risk factors such as BMI, previous history of osteoarthritis/hereditary and previous injuries were also studied. These are also responsible for osteoarthritis. Different joints such as kneel, hand, hip, spine ankle, foot, and fingers were also examined. Of these, analysis carried out showed that kneel is the leading cause of osteoarthritis experienced by Nigerians in south western states. Statistical analysis carried out revealed that there is significant association between all the risk factors examined and the prevalence of osteoarthritis in Nigeria.

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Article submitted 2019-08-21. Resubmitted 2019-09-20. Final acceptance 2019-09-21. Final version published as submitted by the authors.