Research Article

Prevalence and Risk Factors of Lower Back Pain among Healthcare Workers at Aminu Kano Teaching Hospital, Kano, Nigeria

Isyaku Ibrahim[1], Amina Abdurasheed Mustapha[1], Muhammad Abdullahi Umar[2], *Ibrahim Yusuf[1], Hajara Abubakar Sadiq[2], Hamisu Musa Najume[3] and Yohana Ayuba[4]

[1]Department of Human Anatomy, Northwest University Kano, Nigeria
[2]Department of Human Physiology, Northwest University Kano, Nigeria
[3]School of Health Sciences, Maryam Abacha American University Kano, Nigeria
[4]Department of Human Anatomy University of Maiduguri, Nigeria
Corresponding Author's email: Ibrahimyusuf625@gmail.com; Phone: +2348108966280

ABSTRACT

Low back pain (LBP) is among the 10 highest disorders contributing to disability and disease, having a disability-adjusted life years higher than some more well-known diseases or causes such as road traffic accidents, lung cancer, and tuberculosis. The study aims to determine the prevalence of LBP among healthcare workers and to ascertain possible risk factors associated with this condition at Aminu Kano Teaching Hospital (AKTH), Kano, Nigeria. This study was conducted at AKTH. The study is an observational, cross-sectional descriptive study. The study populations included medical personnel in the hospital. A sample of 200 subjects was selected following a systematic sampling technique. The study was conducted in accordance with the Helsinki Declaration. A simple proforma was used to collect biodata, prevalence, risk factors, and preventive measures of LBP. It was observed that 87% of the medical staff are suffering from LBP and only 13% are free from lower back pain. Chi-square test showed that females are more associated with lower back pain, X^2 = 4.65, P = 0.031. The data also shows that 97% of the respondents' onset of low back pain was after they had joined the medical profession. The results show a high prevalence of LBP amongst staff of AKTH, which could be attributed to the nature of their work environment, as the onset is post-employment in most healthcare workers. This study provides insight into the burden of work-related hazards in the Healthcare sector and the prevention strategies.

Keywords: Healthcare Workers; Lower Back Pain; Musculoskeletal Disorder; Occupational Hazard; Prevalence

INTRODUCTION

Many attempts have been made at defining pain but a widely accepted definition was provided by the International Association for the study of Pain (IASP). The most recent reiteration of the definition is that pain is an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage (Raja *et. al*., 2020). Pain is a defense mechanism causes a subject to withdraw the body part from damage or further damage (Sikiru & Hanifa, 2010).

Low back pain (LBP) is stated as lumbosacral pain which causes a hostile subjective sensation best described by the individual suffering it. Low back pain (LBP) is commonly defined as pain localized to the posterior region of the body between the lower rib margin and the lower gluteal folds, with or without pain radiating into the lower limbs, lasting at least one day (IASP, 2021). It has been anticipated as a universal

health problem with its prevalence at about 40% of the general population (Mohammadi *et al*., 2019). LBP is considered one of the highest ten disorders contributing to disability and disease, with a predictable number of disability-adjusted life years complex than some global burdens diseases such as road traffic accident, lung cancer and tuberculosis (Jradi, *et al.,* 2020). The guesstimate is that between 5.0% and 10.0% of cases will advance chronic low back pain (CLBP), which is responsible for sick leave, great treatment costs, and individual suffering (Liao *et al*., 2009). Lower back pain is neither a disease nor a diagnostic unit of any kind (Keriri, 2013). The term states to pain of variable duration in an area of the anatomy afflicted so often that it is has become a paradigm of responses to external and internal stimuli. It is one of the most common causes of musculoskeletal disorder related to work status and condition. It occurs in similar proportions in all cultures, interferes with quality of life and work performance, and is the most common reason for medical consultation (Keriri, 2013)

Low back pain is an important public health problem prevalent all over the world (Oliver *et al.,* 2010). Around 577 million people experienced LBP globally in 2017, a point prevalence of approximately 7.5% (IASP, 2021). In 2020, prevalent cases rose to about 619 million, and LBP remained the leading cause of years lived with disability (YLDs), contributing roughly 69 million disability-adjusted life years (DALYs) worldwide (GBD 2020) and reflecting a substantial public health burden (GBD 2021 Low Back Pain Collaborators 2022; Yang *et. al*., 2025). In Europe, 30% of the general worker population suffers from lower back pain (Keriri, 2013). In the United Kingdom a western country which were previously seen as more affected by the condition, it has been predicted that 116 million production days are missing as a result of low back pain related work incapacity and causing economic cost is around 12 billion pounds (Cunningham *et al*., 2006).

In Africa, LBP is a significant concern among healthcare professionals, particularly nurses. A systematic review reported a pooled 12-month prevalence of 64.1% among nurses in African healthcare settings (Kasa *et. al*., 2020). Research that has been done in South Africa has focused on the low back pain among steel workers. In South Africa it is calculated that 30,000 persons suffer daily from back and neck problems and 10% of them will become chronic cases. Compensation costs for low back pain in South Africa resulted in the equivalent of approximately 20 million US dollars in 2000 (Van-Vuuren *et al*., 2006).

Specifically, in Nigeria and Ethiopia, one study found a 12-month prevalence of LBP of approximately 70.9% among nurses, with female gender, poor ergonomics, and inadequate lifting equipment as prominent risk factors (Sikiru & Hanifa, 2010). Another study in Sokoto, Nigeria, reported lifetime, annual, and point prevalence rates of LBP among tertiary hospital healthcare workers at 56.2%, 39.1%, and 17.2% respectively, with prolonged standing and awkward postures identified as common perceptions of causation (Awosan *et. al*., 2017).

Despite these insights, there is a notable research gap regarding LBP among healthcare workers in Northern Nigeria and particularly at Aminu Kano Teaching Hospital (AKTH). Given the region's high patient load and limited medical staffing, occupational exposures may place healthcare workers at increased risk of LBP, yet data remain sparse. The aim of the present study is to determine the prevalence of lower back pain among healthcare workers and to ascertain possible risk factors associated with this condition at Aminu Kano Teaching Hospital, Kano.

Materials and Methods

Study Population

This study was carried out in Aminu Kano Teaching Hospital (AKTH), the study design is a cross-sectional descriptive study. The study populations included doctors (medical officers, residents and consultants), Lab scientist, Pharmacists, Nurses, Physiotherapy, Medical Record and other Para-medical personal. The systematic sampling technique was then used to select the required number of respondents. The sample size for this study was 200 subjects comprising both 99 male and 101 female participants. A sampling frame of 10 was used, for every 12 subjects 1 was recruited at random for the study.The inclusion criteria included, the respondent must be full time medical staff of AKTH and must have at least one year working experience with Hospital. Informed consent was also obtained from the participants. The study was conducted in accordance with Helsinki declaration.

Data Collection Technique

A simple proforma was used to collect the bio data such as sex, age and ethnicity of the participants and research related data was collected using a pre-tested, mostly closed ended, self-administered questionnaire (but interviewer administered to respondents who could not fill the questionnaire correctly), their knowledge about lower back pain, risk factors of lower back pain and its preventive measures. The instrument has been validated content clarity and alignment with the aim by leading researchers in the field at Northwest University Kano. Two hundred and twenty (220) questionnaires were administered, of which two hundred (200) were adequately completed, yielding a 91% response rate.

Data Analyses

The data obtained were analyzed using frequency and percentage. The chi-square test(x^2) was employed for the relationship between socio-demographic factors (risk factors) and lower back pain. Statistical significance was declared at $p<0.05$. Data was analyzed using SPSS (IBM, corporation, NY) version 20.

Results and Discussion

Results

A total of 200 medical staff of AKTH fully participated in the study. It was observed that 87% of the medical staff are suffering from lower back pain and only13% are free from lower back pain. The result shows a higher prevalence of low back pain amongst staff of Aminu Kano Teaching Hospital as seen in Table 1.

Table 2 shows the relationship between demographic factors (Sex and Age) and lower back pain among AKTH Staff. The results shows that female have higher risk of lower back pain compared to the male and there is correlation between sex and lower back pain with $p<0.05$ and x^2 value 4.65 and that of the age the risk of lower back pain is higher at age of 31-40, where the burden of the work hold in their neck.

Table 1. Frequency distribution of the lower back pain among medical staff of Aminu Kano Teaching Hospital

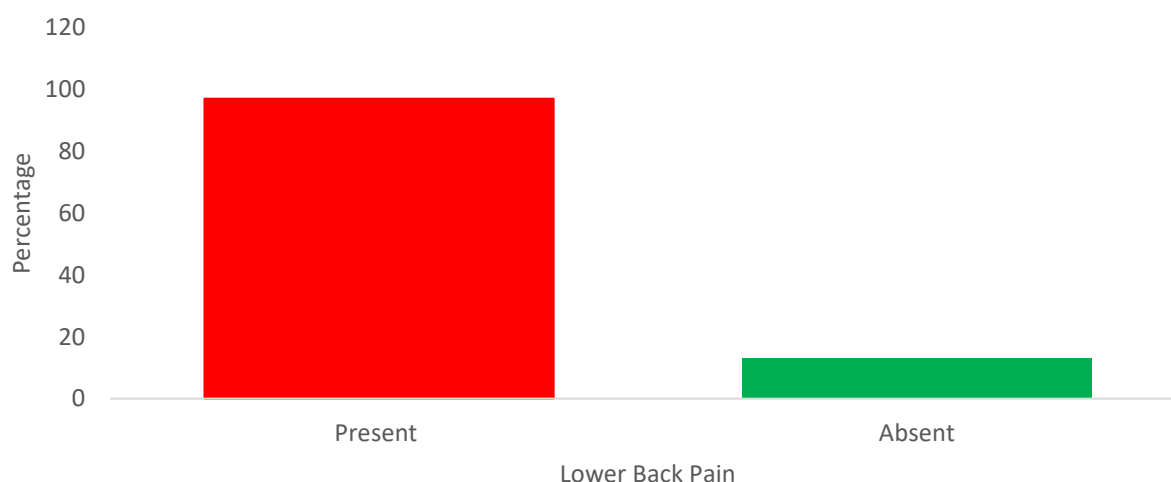| Lower Back Pain	Frequency	Percentage
Absent	26	13.0%
Present	174	87.0%

Figure 1: Frequency distribution of the lower back pain among medical staff of Aminu Kano Teaching Hospital

Table 2. Chi-square test of demographic factors (Sex and Age) and lower back pain among the staff of Aminu Kano Teaching Hospital

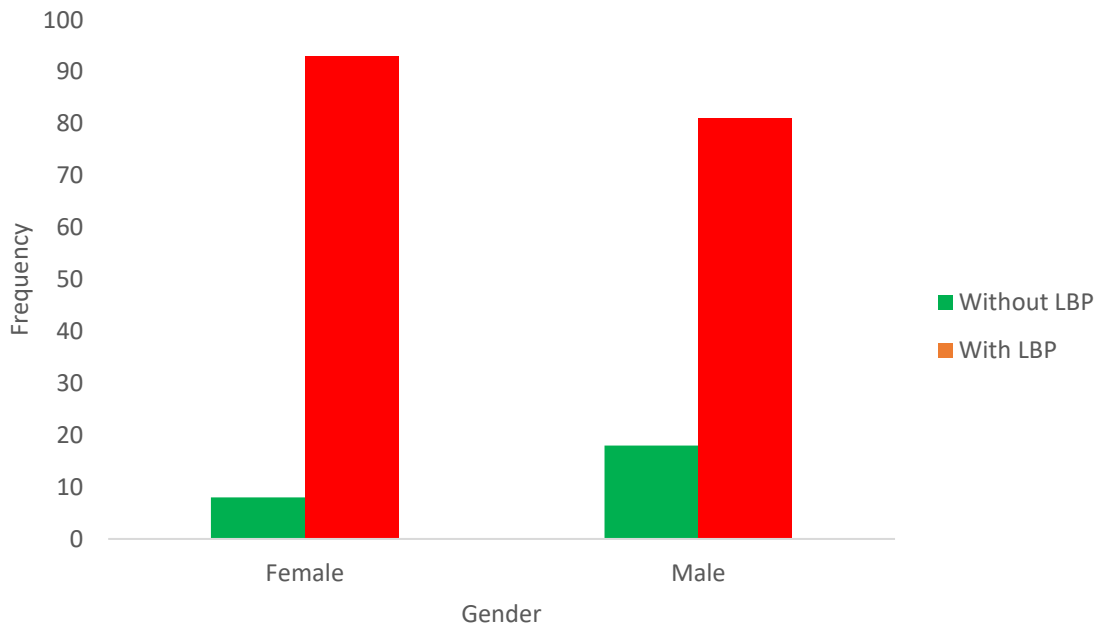| Variables	Category	Without LBP ()	with LBP	X²	P Value
Sex	Male	18	81	4.65	0.031
	Female	8	93		
Age	<20	5	13		
	21-30	19	65		
	31-40	0	61	22.751	0.000
	40-50	0	22)		
	>51	2	13		

Figure 2. Distribution of the occurrence of lower back pain by gender among the staff of Aminu Kano Teaching Hospital
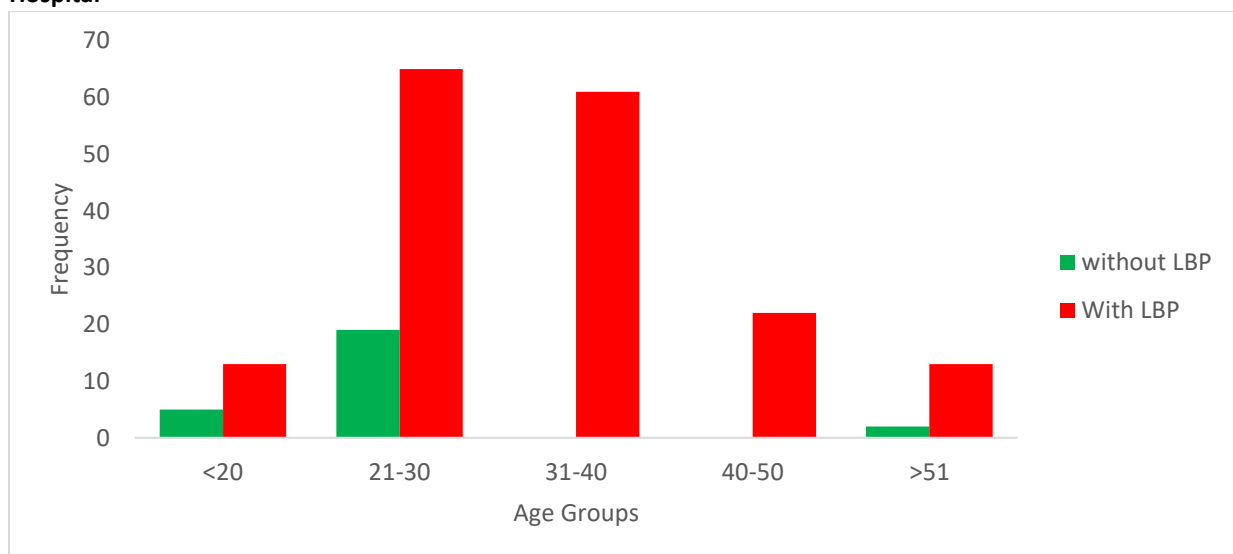

Figure 3. Distribution of the occurrence of lower back pain by age group among the staff of Aminu Kano Teaching Hospital

Table 3 shows the relationship between Body Mass Index (BMI), Educational level, Gym, standing time and Sitting time with lower back pain disorder. The results shows that there is correlation between BMI and lower back pain and the risk is higher in obese individual, similarly the Gym has negative correlation with lower back pain exercise reduce the risk of lower back pain, however, there is also correlation between standing time and lower back pain but the results show no correlation between sitting time and lower back pain.

Table 4 shows frequency and percentage of professions with or without Lower Back Pain. The result shows that nursing cadres have the highest percentage (100%) affected with lower back pain follows by medical doctors with 87.74% affected with lower back pain and the lowest other cadres with 33.33% affected with lower back pain.

Table 5 shows the frequency and percentage of first sign and symptoms of lower back pain. The results shows that 97.13% of the affected individual has been affected after joining medical profession and only 2.87% was affected by lower back pain before joining the medical profession.

Table 3. Relationship between BMI, Educational level, Gym, standing time and Sitting time with lower back pain disorder

Variables		No. LBP	LBP	X^2	P Value
BMI	Under weight	2(1.7)	11(11.3)		
	Normal weight	21(21.6)	145(144.4)	7.693	0.05
	Over weight	0(0.9)	7(6.1)		
	Obese	0(1.8)	14(12.2)		
Educ. Level	Diploma	11(4.3)	22(28.7)		
	Degree	13(17.8)	124(119.2)	14.620	0.001
	Post-graduate degree	2(3.9)	28(26.1)		
Gym	Yes	17(22.2)	154(148.8)		
	No	9(3.8)	20(25.2)	9.754	0.005
Standing Time	1-4	5(8.7)	62(58.3)		
	>5	21(17.5)	112(90.5)	14.190	0.001
Sitting Time	1-4	17(16.8)	112(112.2)		
	>5	9(9.2)	62(61.8)	0.010	0.553

Table 4: Frequency and Percentage of professions with or without Lower Back Pain

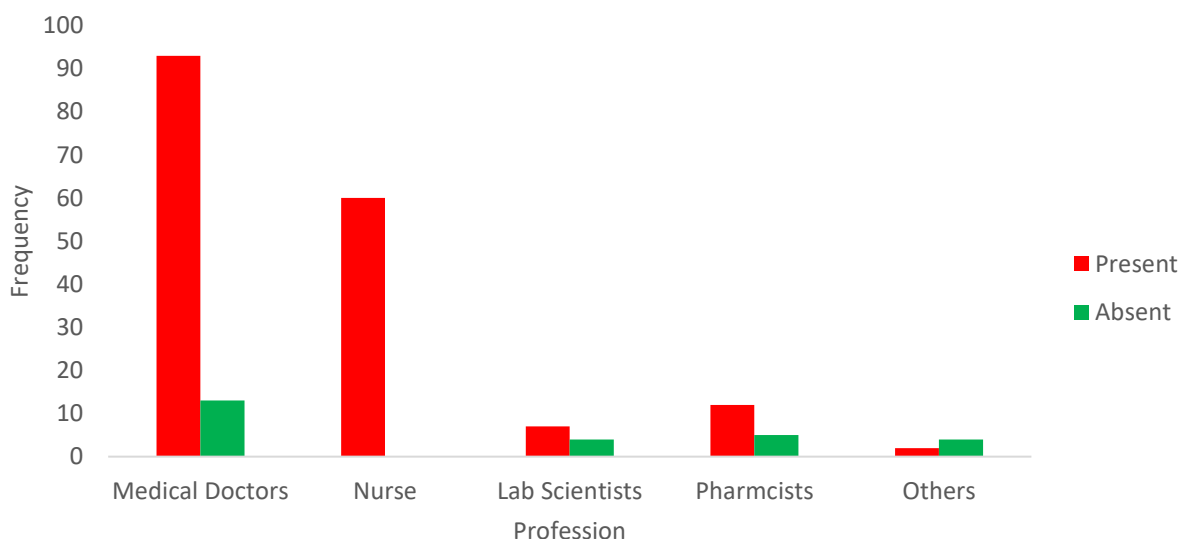| S/N	Category	Frequency	Percentage
Medical Doctor	Present	93	87.74%
	Absent	13	12.26%
Nurse	Present	60	100%
	Absent	00	00%
Lab scientist	Present	07	63.64%
	Absent	04	36.36%
Pharmacists	Present	12	70.59%
	Absent	05	29.41%
Others	Present	02	33.33%
	Absent	04	66.67%
Total		200	

Figure 4. Distribution of Lower Back Pain by Profession

Table 5. Frequency and Percentage of first sign and symptoms of lower back pain.

First lower back pain	Frequency	Percentage
Before joining medical	5	2.87%
After joining medical	169	97.13%
Total	174	100%

Table 6 shows frequency and percentage of intensity of Lower Back Pain. The result shows that most of the staff of AKTH have moderate intensity with 67.24% follows by severe intensity with 20.69% and no pain at moment shows least intensity with 0.00%.

Table 6: Frequency and Percentage of intensity of the Lower Back Pain

S/N	Frequency	Percentage
No pain at the moment	00	0.00%
Mild	15	8.62%
Moderate	117	67.24%
Severe	36	20.69%
Worst imaginable	06	3.45%
Total	174	100%

DISCUSSION

Low back pain (LBP) is referred to as lumbosacral pain, which cause an unpleasant subjective feeling best described by those who suffering it. It has been seen as a worldwide health problem with an estimated prevalence of 40% among general population (Mohammadi *et al.*, 2019). The total prevalence rate of LBP in this research was recorded as 87%, which show a very high prevalence. In Swiss nurses, the annual prevalence of LBP was found to be within the range of 73% and 76% (Maul *et al.*, 2003). Sikiru and Shmaila (2009) reported that the prevalence of LBP was 70.87% in African nurses during the previous 12 months. Research carried out in a Slovenian hospital showed a prevalence rate of 85.9% among nurses. Similarly, a study on back pain prevalence among different occupational groups in Nigeria revealed that nurses had a prevalence of 69%, highlighting that nursing staff have the highest rate (Ng'uurah, 2004), According to our research, the nursing staff at Aminu Kano Teaching Hospital had the most affected workers, with 100% suffering from lower back pain compared to other occupations included in the study. This high prevalence among

nurses is linked to the long working hours high number of patients attended and low number of nurses per patient. To add to these conditions nurses are involved in moving patients i.e lifting and moving them on wheel chairs or beds, overly long standing and use of non-ergonomic chairs desks when seated coupled with poor postures. Studies in rural Japan, has shown that 83% of nurses reported chronic LBP, which was associated with lifting, moving, and transferring patients (Van- Vuuren, 2006). Based on this data, our results indicate a higher prevalence of LBP than earlier findings, which clearly shows the heavy workload in patient care for staff at Aminu Kano Teaching HospitalAll participants in this study within the age range of 30 to 40 years reported current lower back pain, and chi-square analysis showed a significant association between age and LBP. A higher statistically significant relationship was observed in this age group. Research has found that LBP is common across all age groups, particularly younger adults (Hoy *et al*., 2012). Among respondents aged 30–39 years, 68% reported low back pain, and a positive, statistically significant relationship (p≤0.05) was noted between this age group and LBP (Dlungwane *et al*. 2018). A study in South Africa's Tshwane Hospital revealed that 50% of respondents aged 26–40 years suffered from LBP, more than other age groups (KwaZulu Natal Department of Health 2010). The present study shows a strong correlation between LBP and age, with the risk peaking between 31–40 years due to the workload burden on this group. However, other research suggests that the link between age and LBP may depend on occupational, household, leisure activities, and posture (Cunningham, 2006).

This study also found a higher prevalence of LBP among women compared to men, with 53% of female participants having the disorder. Women's susceptibility to LBP might be due to specific physical factors like a lower pain threshold or hormonal changes during menstruation (Ísper *et al*., 2015). Studies on female nurses in Saudi Arabia (Keriri, 2013), and Slovenia (Skela-Savič *et al*., 2017) also reported higher LBP prevalence among women. While some research indicates women are more at risk for LBP, others show no significant gender differences (Sikiru and Hanifa, 2010). Women and men perceive and interpret pain differently due to cultural and social expectations (Barksy *et al.,* 2001).

Boys are often taught not to cry or show weakness, while women may experience heightened pain perception. Pregnancy can further increase LBP in women due to weight gain, fetal pressure on the spine, and hormonal changes affecting the spine and sacroiliac joints (To and Wang, 2003). Epidural anesthesia during labor is also linked to increased incidence of LBP due to motor block and poor posture. Based on our findings and previous studies, women are at a higher risk of LBP compared to men, indicating a correlation between sex and LBP.

The present study also identified a link between LBP and BMI. All overweight and obese staff reported LBP, although their numbers were lower compared to other categories. This aligns with research showing a higher prevalence of LBP among overweight (57%) and obese (62%) respondents than those of normal or underweight categories (25%) Dlungwane, (2018). Obese respondents were nearly five times more likely to report LBP than those of normal weight. High BMI has also been linked to disc deterioration due to mechanical stress from excess weight around the waist (Hangai *et al.,* 2008). However, some studies debate the relationship between obesity and LBP, suggesting no clear dose-response relationship (Hangai *et al.,* 2008).

Our study also found that 97.13% of affected individuals developed LBP after joining the medical profession, with only 2.87% experiencing it before. This suggests the high workloads in patient care are a significant factor. Factors like gym use were negatively correlated with LBP, as exercise reduces the risk. Conversely, standing time was positively correlated with LBP, while sitting time showed no association. The study also found a link between professions and LBP, with higher work experience significantly associated with the condition. The study identified 2 key ways of preventing or managing lower back pain among healthcare workers such as; having a strong and healthy back through exercise and the adoption of smart postures when standing, sitting walking and lifting.

CONCLUSION

The findings of this study indicate a very high prevalence of Lower Back Pain among healthcare workers at Aminu Kano Teaching Hospital Kano, which is more pronounced among the nurses. The prevalence is seen to be affected by numerous factors

such as age, gender and BMI. Intervention should first look into refining the work condition most especially of nurses by reducing the work hours and the ratio of workers to patients and also the provision of the appropriate ergonomic office furniture's. Healthcare workers also need to be sensitized on efficient postures as strategy of preventing lower back pain and the need for exercise and maintenance of personal overall health and wellbeing.

Conflict of Interest
The authors declare no conflict of interest.

Research Funding
The Research did not receive any specific grant from funding agencies in public, commercial or non-profit sector.

REFERENCES
Andrusaitis, S. F., Oliveira, R. P., & Barros Filho, T. E. (2006). Study of the prevalence and risk factors for low back pain in truck drivers in the state of São Paulo, Brazil. *Clinics (Sao Paulo, Brazil), 61*(6), 503–510.https://doi.org/10.1590/s180759322006000600 003

Awosan, K. J., Yikawe, S. S., Oche, O. M., & Oboirien, M. (2017). Prevalence, perception and correlates of low back pain among healthcare workers in tertiary health institutions in Sokoto, Nigeria. *Ghana medical journal, 51*(4), 164–174.

Barsky, A. J., Peekna, H. M., & Borus, J. F. (2001). Somatic symptom reporting in women and men. *Journal of general internal medicine, 16*(4), 266–275. https://doi.org/10.1046/j.1525-1497.2001.00229.x

Cunningham, C., Flynn, T., & Blake, C. (2006). Low back pain and occupation among Irish health service workers. *Occupational medicine (Oxford, England), 56*(7), 447–454. https://doi.org/10.1093/occmed/kql056

Dlungwane, T., Voce, A., & Knight, S. (2018). Prevalence and factors associated with low back pain among nurses at a regional hospital in KwaZulu-Natal, South Africa. *Health SA = SA Gesondheid, 23*, 1082. https://doi.org/10.4102/hsag.v23i0.1082

Garbin, A. J. Í., Garbin, C. A. S., Arcieri, R. M., Rovida, T. A. S., & Freire, A. C. da G. F. (2015). Musculoskeletal pain and ergonomic aspects of dentistry (Version 1). *SciELO journals*. https://doi.org/10.6084/m9.figshare.14325780.v1

GBD 2021 Low Back Pain Collaborators (2023). Global, regional, and national burden of low back pain, 1990-2020, its attributable risk factors, and projections to 2050: a systematic analysis of the Global Burden of Disease Study 2021. *The Lancet. Rheumatology, 5*(6), e316–e329. https://doi.org/10.1016/S2665-9913(23)00098-X

Han, T. S., Schouten, J. S., Lean, M. E., & Seidell, J. C. (1997). The prevalence of low back pain and associations with body fatness, fat distribution and height. *International journal of obesity and related metabolic disorders: journal of the International Association for the Study of Obesity, 21*(7), 600–607. https://doi.org/10.1038/sj.ijo.0800448

Hangai, M., Kaneoka, K., Kuno, S., Hinotsu, S., Sakane, M., Mamizuka, N., Sakai, S., & Ochiai, N. (2008). Factors associated with lumbar intervertebral disc degeneration in the elderly. *The spine journal: official journal of the North American Spine Society, 8*(5), 732–740. https://doi.org/10.1016/j.spinee.2007.07.392

Hoy, D., Bain, C., Williams, G., March, L., Brooks, P., Blyth, F., Woolf, A., Vos, T., & Buchbinder, R. (2012). A systematic review of the global prevalence of low back pain. *Arthritis and rheumatism, 64*(6), 2028–2037. https://doi.org/10.1002/art.34347

International Association for the Study of Pain. (2021, July 9). *The global burden of low back pain*. https://www.iasp-pain.org/resources/fact-sheets/the-global-burden-of-low-back- pain

Jradi, H., Alanazi, H., & Mohammad, Y. (2020). Psychosocial and occupational factors associated with low back pain among nurses in Saudi Arabia. *Journal of occupational health, 62*(1), e12126. https://doi.org/10.1002/1348-9585.12126

Kasa, A. S., Workineh, Y., Ayalew, E., & Temesgen, W. A. (2020). Low back pain among nurses working in clinical settings of Africa: systematic review and meta-analysis of 19 years of studies. *BMC musculoskeletal disorders, 21*(1), 310. https://doi.org/10.1186/s12891-020-03341-y

Keriri, H. M. (2013). Prevalence and risk factors of low back pain among nurses in operating rooms, Taif. Saudi Arabia. *American Journal of Research Communication, 1*(11):45–70.

KwaZulu Natal Department of Health (2010). *Guide on the Retention Strategy of Employees in the Department* [document on internet].South Africa,

[cited 2010 April 14]. Available from: http//www.kznhealth.gov.za.

Liao, Z. T., Pan, Y. F., Huang, J. L., Huang, F., Chi, W. J., Zhang, K. X., Lin, Z. M., Wu, Y. Q., He, W. Z., Wu, J., Xie, X. J., Huang, J. X., Wei, Q. J., Li, T. W., Wu, Z., Yu, B. Y., & Gu, J. R. (2009). An epidemiological survey of low back pain and axial spondyloarthritis in a Chinese Han population. *Scandinavian journal of rheumatology, 38*(6), 455–459. https://doi.org/10.3109/03009740902978085

Maul, I., Läubli, T., Klipstein, A., & Krueger, H. (2003). Course of low back pain among nurses: a longitudinal study across eight years. *Occupational and environmental medicine, 60*(7), 497–503. https://doi.org/10.1136/oem.60.7.497

Mohammadi, M., Vaisi-Raiegani, A. A., Jalali, R., Ghobadi, A., & Salari, N. (2019). The prevalence of low back pain among Iranian hospital nurses: A systematic review and meta-analysis. *Nursing and Midwifery Studies, 8*(1), 1–6. http://dx.doi.org/10.4103/nms.nms_46_18

Ng'uurah, J.N. (2004). *Health education needs among individuals with low back pain*. Masters [thesis]. University of Western Cape. Available from: https://uwcscholar.uwc.ac.za/items/51082685-e94f-4320-a3a7-4639457e0391

Olivier, B., Mudzi, W., Mamabolo, M.V., Becker P.J. (2010). The association between psychological stress and low back pain among district hospital employees in Gauteng, *South Africa. South African Journal of Physiotherapy, 66*(2):17-21. https://doi.org/10.4102/sajp.v66i2.63

Raja, S. N., Carr, D. B., Cohen, M., Finnerup, N. B., Flor, H., Gibson, S., Keefe, F. J., Mogil, J. S., Ringkamp, M., Sluka, K. A., Song, X. J., Stevens, B., Sullivan, M. D., Tutelman, P. R., Ushida, T., & Vader, K. (2020). The revised International Association for the Study of Pain definition of pain: concepts, challenges, and compromises. *Pain, 161*(9), 1976– 1982. https://doi.org/10.1097/j.pain.0000000000001939

Russell, R., Dundas, R., & Reynolds, F. (1996). Long term backache after childbirth: prospective search for causative factors. *BMJ (Clinical research ed.), 312*(7043), 1384–1388. https://doi.org/10.1136/bmj.312.7043.1384a

Sikiru, L., & Hanifa, S. (2010). Prevalence and risk factors of low back pain among nurses in Nigeria. *African Health Sciences, 10*(1), 26–30. https://doi.org/10.4314/eajph.v6i1.45737

Sikiru, L., & Shmaila, H. (2009). Prevalence and risk factors of low back pain among nurses in Africa: Nigerian and Ethiopian specialized hospitals survey study. *East African journal of public health, 6*(1), 22–25. https://doi.org/10.4314/eajph.v6i1.45737

Skela-Savič, B., Pesjak, K., & Hvalič-Touzery, S. (2017). Low back pain among nurses in Slovenian hospitals: cross-sectional study. *International nursing review, 64*(4), 544–551. https://doi.org/10.1111/inr.12376

To, W. W., & Wong, M. W. (2003). Factors associated with back pain symptoms in pregnancy and the persistence of pain 2 years after pregnancy. *Acta obstetricia et gynecologica Scandinavica, 82*(12), 1086–1091. https://doi.org/10.1046/j.1600-0412.2003.00235.x

Van Vuuren, B., van Heerden, H. J., Zinzen, E., Becker, P., & Meeusen, R. (2006). Perceptions of work and family assistance and the prevalence of lower back problems in a South African manganese factory. Industrial health, 44(4), 645–651. https://doi.org/10.2486/indhealth.44.645

Yang, N., Di, J., Wang, W., & Feng, H. (2025). Global burden of low back pain from 1990 to 2021: a comprehensive analysis of risk factors and trends using the Global Burden of Disease Study 2021. *BMC public health, 25*(1), 1886. https://doi.org/10.1186/s12889- 025-23178-1.