PJAHS
Philippine Journal of Allied Health Sciences

Original Article

Association between Pregnancy-Related Low Back Pain, Physical Activity, and Health-related Quality of Life: A Survey of Pregnant Women in Northern Nigeria

Aliyu Lawan[1], Adedapo Wasiu Awotidebe[2], Umar Muhammad Bello[3], Adamu Ahmad Rufa'i[1], Cornelius Mahdi Ishaku[1], Mamman Ali Masta[1], Akindele Mukadas[2]

[1]Department of Medical Rehabilitation, Faculty of Allied Health Sciences, College of Medical Sciences, University of Maiduguri, Maiduguri, Nigeria.; [2]Department of Physiotherapy, Faculty of Allied Health Sciences, College of Medicine, Bayero University Kano, Kano, Nigeria; [3]Department of Physiotherapy, Yobe State University Teaching Hospital (YSUTH), Damaturu, Nigeria.

Correspondence should be addressed to: Aliyu Lawan[1]; aliyulawan@unimaid.edu.ng

Article Received: December 25, 2020

Article Accepted: March 23, 2021

Article Published: August 15, 2021 (Online)

Abstract

Background: Pregnancy-related low back pain is a common complaint with numerous adverse consequences. Unfortunately, the effect of health-related quality of life and physical activity status on pregnancy-related low back pain remains understudied. **Objectives**: This study aimed to examine the influence of physical activity and health-related quality of life on pregnancy-related low back pain among pregnant women. **Methods:** A survey of 398 pregnant women was conducted using the Modified Pregnancy Low Back Pain, Medical Outcome Survey Short Form (MOS-SF), and Pregnancy Physical Activity Questionnaire (PPAQ) to assess pregnancy-related low back pain, quality of life, and physical activity status among the participants. **Results:** About fifty-four percent (54%) of the pregnant women reported experiencing low back pain during pregnancy. There were no significant differences between most physical activity intensities and domains for pregnant women with and without pregnancy-related low back pain, with the exception of women identified as sedentary (12.9±14.8 versus 17.4±16.2) or inactive (18.7±20.0 versus 23.6±19.8). Furthermore, waist circumference (*OR*: 0.97; 95% CI: 0.96 to 0.99) and Physical component scores (PCS) (*OR*: 0.96; 95% CI: 0.93 to 0.98) were associated with pregnancy-related low back pain. An interaction of height and occupation also showed an association with pregnancy related low back pain (*OR*: 1.04; 95% CI: 1.01 to 1.08). **Conclusions:** Sedentary and inactivity are the only physical activity intensity and domain associated with pregnancy-related low back pain, which affect the physical well-being of the expecting mothers.

Keywords*: Pregnancy Physical activity; Sedentary behavior; Exercise; Gestation; Back pain*

INTRODUCTION

Pregnancy is a crucial period in a woman's life that is associated with marked physiological and structural changes in response to the demands of the growing fetus.[1] These changes may affect the musculoskeletal system and other comorbid conditions such as low back pain. Pregnancy-related low back pain have been reported to affect the overall health of pregnant woman and the developing fetus.[2]

Pregnancy-related low back pain (PLBP) is the most common musculoskeletal condition affecting pregnant women. The incidence of PLBP ranges between 25% and 90%, varying by population, in both retrospective and prospective studies.[3] In Nigeria, it has been estimated that about 50% of pregnant women may present with PLBP at some point during their pregnancy.[4,5] Pregnancy-related low back pain can be severe, causing a decline in activities of daily living in 80% of pregnant women, with another 10% reporting work absences or the inability to work entirely due to PLBP.[6,7] A substantial proportion (19%) of American women avoid having another pregnancy for fear of recurring PLBP.[8]

Low back pain in the general population is associated with physical, emotional, and socioeconomic consequences. This may affect physical performance and HRQoL. The association between low back pain, physical activity and HRQoL are expected to be severe during pregnancy due to hormonal changes and the weight of the growing fetus.[9]

A previous study[10] reported that quality of life of Pregnant women with lumbo-pelvic pain was severely affected compared to the group without the pain. However, inconsistent findings were reported by Coban et al.,[11] indicating that the intensity of back pain is not associated with quality of life but with decreased physical activity. Other studies indicated the need for further research in this area as there is limited knowledge regarding the quality of life (physical and mental health) of pregnant women with PLBP.[12-14] Although, a previous study indicated a significant reduction in physical activity as pregnancy advances,[15] another study within the same population[5] reported no association between total daily activity and PLBP. However, the influences between specific physical activity domains, intensities and HRQoL on PLBP have not been investigated. Therefore, the objectives of this study were to examine the association between physical activity, HRQoL and PLBP among pregnant women. Also, the study sought to examine the pattern and distribution of PLBP, and to assess the ability of relevant socio-demographic, clinical and anthropometric variables to influence PLBP.

METHODS

Ethical Consideration. Ethical clearance (UMTH/REC/2016/II/04) for the study was obtained from the Ethical Committee of the University of Maiduguri Teaching Hospital, Maiduguri, Nigeria prior to data collection.

Sample Size. Convenience sampling was used to recruit 389 pregnant women without comorbidities to participate in this cross-sectional survey. Participants attended the antenatal clinic at the University of Maiduguri Teaching Hospital. The required sample size was determined using an estimated proportion method[16] based on a PLBP prevalence of 52% in a previous study.[5]

Study Questionnaires. A 38-item modified Pregnancy Low Back Pain Questionnaire[5], which has demonstrated good reliability (r= 0.89) in a previous study by Oyeyemi et al.[5], was used to assess the presence of PLBP among the participants. The medical outcome survey short form (MOS-SF) questionnaire was used to assess HRQoL. Answers for the 12-item questionnaire are based on a Likert scale. An online MOS-SF calculator was used to calculate the physical component score (PCS) and mental component score (MCS) of the MOS-SF. While the average scores of the PCS and MCS were averaged to estimate the overall HRQoL score for the pregnant women, with higher MOS-SF scores indicating better overall HRQoL. A high internal consistency (Cronbach's alpha > 0.80) has been demonstrated for both the PCS and MCS.[17] High test-retest reliability (ICC= 0.78) for PCS and moderate test-retest reliability (ICC= 0.60) for MCS have also been reported previously.[17]

Study Procedure. Pregnant women were contacted prior to their clinical appointments at the antenatal unit of the University of Maiduguri Teaching Hospital. Data were collected by the principal investigator and a trained research assistant. Before the data collection, the research assistant participated in a 2-hour daily training session for three days. This was done to ensure scoring consistency between the research assistant and the principal investigator (AL) for all questionnaire items. Scoring consistency between the two raters was determined using a two-way random effects intraclass correlation coefficient with 95% confidence interval for absolute agreement (ICC= 0.69, 95% CI= 0.59-0.77). Each participant was provided with a written form (information sheet) explaining the merits/demerits of participating in the study as well as any foreseen benefit/harm. Prior to administering the questionnaire, informed consent was obtained from each participant. Socio-demographic and anthropometric variables (i.e., weight, height, and waist and hip circumference) were also measured. A detailed description of the data collection protocol used has been reported in previous studies.[15,18]

Statistical Analysis. Descriptive statistics (i.e., mean, standard deviation, frequencies, and percentages) were tabulated for all socio-demographic characteristics, the pattern of PLBP and HRQoL. Significant differences in the results of continuous variables (e.g., age, height, weight, waist and hip circumferences etc.) and categorical variables (e.g., trimester of pregnancy, level of formal education etc.) for participants with and without PLBP were determined using independent t-tests and chi-square tests, respectively. Logistic regression was used to determine the association between the presence of PLBP, physical activity and HRQoL. The normality curve for each variable was checked using a histogram[19] and where data were not normally distributed, the appropriate log transformation was used to transform the data. Data were transformed depending on the type and extent of skewness using, square root, logarithm and inverse transformation, the corresponding reflects for left and right skewedness respectively.[19] All potential confounders (e.g. maternity record and anthropometrics) in the association were selected based on careful review of the literature and as contained in the questionnaires. Furthermore, univariate analysis was conducted for all the independent variables versus the dependent variable.Variables that are significantly associated (p-values <0.05) were selected and included into the multivariable regression analysis. Issue of multicollinearity was checked among the independent variables through testing association between each variable, inflation factor and model fit (Omnibus test) were also used. All data were computed for analysis using Statistical Package for Social Sciences software (SPSS, version 22, IBM, Armonk, NY, USA). The level of significance was set at an alpha of ≤ 0.05.

RESULTS

Characteristics and Differences in the Socio-Demographic, Clinical and Anthropometric Variables Between Pregnant Women with and without PLBP. Table 1 shows the characteristics of the participants. The mean age, body mass index and waist-hip ratio were 27.86±5.15 years, 22.22±11.79 Kg/m^2 and 0.96±0.56, respectively. Most of the pregnant women (72.61%) had a tertiary level of education and were multiparous (66.92%), with a previous history of vaginal delivery (81.91%).

The pregnant women recruited in this study were categorized as those having PLBP (*n*= 216) and those without PLBP (*n*= 182). There were no significant between-group differences in age (*t*= -0.35, *p*= 0.73) or body mass index (t= 0.40, p= 0.69). However, a significant difference was observed for waist-hip ratio (*t*= 2.29, *p*= 0.02), with a higher mean value 1.03±0.55 obtained from women without PLBP compared to those presenting with PLBP (0.90±0.56). Similarly, a significant difference was observed between the groups for occupational status (x^2= 0.14; *p*= 0.05). The occurrence of PLBP by trimester of pregnancy showed no significant between-groups difference (x^2= 0.08; *p*= 0.28) (Table 1).

Table 1: Characteristics of participants

Variables	Total (*n*= 398)	PLBP (*n*= 216)	No PLBP (*n*= 182)	*t*/x^2-value	*p*-value
Age*	27.86±5.15	27.94±5.14	27.76±5.16	-0.35	0.73
Weight*	71.70±13.81	72.04±13.80	71.30±13.83	-0.48	0.63
Height*	1.61±0.05	1.60±0.05	1.62±0.05	2.88	0.01
BMI*	22.22±11.79	22.00±12.34	22.47±11.13	0.40	0.69
Waist Circumference*	64.69±16.55	61.28±14.28	68.46±18.04	3.90	0.01
Hip Circumference*	55.73±14.89	54.74±13.45	56.82±16.32	1.22	0.22
W:H Ratio*	0.96±0.56	0.90±0.56	1.03±0.55	2.29	0.02
Occupation				**0.14**	**0.05**
Civil servants	119 (29.90%)	62 (52.10%)	57 (47.90%)		

Table 1: (continued)

Business	33 (8.29%)	11 (33.33%)	22 (66.66%)		
Full housewife	132 (33.17%)	78 (59.09%)	54 (40.91%)		
Student	114 (28.64%)	65 (57.02%)	49 (42.98%)		
Education				**0.069**	**0.60**
No formal	11 (2.76%)	8 (72.72%)	3 (27.27%)		
Primary	7 (1.76%)	3 (42.86%)	4 (57.14%)		
Secondary	91 (22.86%)	49 (53.84%)	42 (46.15%)		
Tertiary	289 (72.61%)	156 (53.98%)	133 (46.02%)		
Trimester				**0.08**	**0.28**
First	29 (7.29%)	17 (58.62%)	12 (41.38%)		
Second	122 (30.65%)	59 (48.36%)	63 (51.64%)		
Third	247 (62.06%)	140 (56.68%)	107 (43.32%)		
Parity Status				**0.37**	**0.45**
Nulliparous	131 (33.08%)	68 (51.91%)	63 (48.09%)		
Multiparous	265 (66.92%)	148 (55.85%)	117 (44.15%)		
Previous Delivery				**0.629**	**0.26**
Vaginal Delivery	240 (81.91%)	132 (55.00%)	108 (45.00%)		
Caesarean Section	47 (16.04%)	29 (61.70%)	18 (38.30%)		
Both	6 (2.05%)	2 (33.33%)	4 (66.66%)		

Note: *Variables analyzed using independent t-test statistics for continuous and chi-square statistics for categorical variables

Pattern and Distribution of Pregnancy-Related Low Back Pain. Table 2 shows the pattern and distribution of PLBP among participants. The majority reported having PLBP (*n*= 216; 54.27%). Among the participants with PLBP, 171 (79.16%) reported having the first episode of low back pain during pregnancy, whereas 45 (20.83%) reported having experienced low back pain before pregnancy. A greater number of pregnant women reported having pain during the daytime (*n*= 91, 42.13%), followed by those reporting nighttime pain (n= 85, 39.35%), and those with pain throughout the day (*n*= 21, 9.72%). The lumbar was the most frequently reported pain region (*n*= 132, 61.11%), whereas the sacroiliac (n= 66, 30.55%) and lumbosacral regions (*n*= 18, 8.33%) were less reported. The intensity of the pain was rated as either mild (n= 30, 13.89%), moderate (*n*=134, 62.03%) or severe (*n*= 52, 24.07%).

Differences in Health-Related Quality of Life and Physical Activity Level Between Pregnant Women with and without PLBP. Table 3 summarizes the differences in physical activity and HRQoL among the participants. A significant difference was observed on sedentary intensities (12.87±14.80 vs 17.44±16.17; *p*= 0.003) and inactivity domain (18.68±19.78 vs 23.59±19.78; *p*= 0.015) of physical activity among pregnant women with PLBP compared to those without PLBP. Also, a significant between-group differences for the PCS (41.95±9.60 vs 45.50±8.42; *p*= 0.001) and overall HRQoL (40.45±13.97 vs 45.13±10.50; *p*= 0.001) for pregnant women with vs without PLBP. Also, pregnant women without PLBP tend to have a higher non-significant (*p*= 0.162) mean score (47.83±9.03) of the mental component score of HRQoL compared to pregnant women with PLBP (46.54±8.75).

Socio-Demographic and Anthropometric Correlates of PLBP. The logistic regression model for variables associated with PLBP shows waist circumference (*OR*: 0.97; 95% CI: 0.96-0.99), PSC (*OR*: 0.96; 95% CI: 0.93-0.98), height (*OR*: 0.01; 95% CI: 0.01-0.32) and occupation (*OR*: 0.1; 95% CI: 0.02-0.48) were associated with PLBP in the model. In testing the interaction of height and occupation (civil servants, businesswomen, housewives or students), women working in business were associated with PLBP (*OR*: 1.04; 95% CI: 1.01-1.08). Details of socio-demographic and anthropometric correlates of PLBP is shown in Table 4.

Table 2: Pattern and Distribution of Pregnancy-related Low Back Pain (*n*= 216)

Variables	Frequency	Percentage
First Episode of Occurrence		
Before pregnancy	45	20.83
During pregnancy	171	79.16
Time of Pain Occurrence		
Morning	19	8.80
Day Time	91	42.13
Night	85	39.35
All-day	21	9.72
Duration of Pain		
Seconds	7	3.24
Minutes	116	53.70
Hours	93	43.06
Aggravating Factors		
Rest	28	12.96
Activities	164	75.93
Others	24	11.11
Relieving Factors		
Rest	162	75.00
Activities	26	12.04
Others	28	12.96
Treatment of PLBP		
Visit hospital	84	38.89
Self-medication	34	15.74
Nothing	98	45.37
Location of LBP		
Lumbar region	132	61.11
Sacro-iliac region	66	30.55
Lumbosacral Region	18	8.33
Nature of the Pain		
Aching	87	40.28
Throbbing	51	23.61
Shooting	34	15.74
Stabbing	44	20.37
Pattern of Radiation		
No radiation	123	56.94
Down the thigh	67	31.02
Down the calf	26	12.04
Grade of the Pain		
Mild	30	13.89
Moderate	134	62.03
Severe	52	24.07

Table 3: Differences in Physical Activity level and Health-Related Quality of Life among pregnant women with and without Pregnancy-induced low back pain

Variables	Total (*n*= 398)	LBP (*n*= 216)	No LBP (*n*= 182)	*t*-value	*p*-value
PA Intensities					
Sedentary	14.96±15.58	12.87±14.80	17.44±16.17	2.95	0.003
Light Intensity activity	86.71±64.13	82.82±63.43	91.33±64.76	1.32	0.187
Moderate intensity activity	48.19±71.13	48.93±79.29	47.31±60.24	-0.23	0.822
Vigorous	1.50±4.93	1.59±5.21	1.40±4.58	-0.38	0.708

PA Domains					
Household	82.95±78.46	83.08±85.42	82.80±69.54	-0.04	0.971
Occupation	27.40±46.96	25.22±44.86	29.99±49.34	1.01	0.313
Sport and exercise	4.66±9.15	4.79±9.95	4.51±8.13	-0.30	0.762
Transportation	15.70±23.88	14.28±21.67	17.37±26.23	1.29	0.198
Inactivity	20.92±20.02	18.68±19.78	23.59±19.78	2.45	0.015
Total Activity Duration	68.85±52.68	65.06±55.58	73.36±48.78	1.59	0.113
Total Activity Intensity	151.13±132.08	145.82±142.45	157.43±118.67	0.87	0.383
HRQoL					
Physical Composite Score	43.62±9.20	41.95±9.60	45.50±8.42	3.80	0.001
Mental Composite Score	47.15±8.89	46.54±8.75	47.83±9.03	1.40	0.162
Overall HRQoL	42.60±12.70	40.45±13.97	45.13±10.50	3.72	0.001

Table 4: Logistic Regression Predictors of Occurrence of Pregnancy-related Low Back Pain

Predictors	**Interaction**		
	Exp(β)	**95% CI**	***p*-value**
Sedentary Act	0.99	0.97; 1.01	0.340
Occupation (cat)			
Civil servants	1.00		0.099
Business	0.10	0.02; 0.48	0.004
Full-time housewife	2.57	0.96; 6.89	0.061
Student	1.59	0.68; 3.69	0.283
Height	0.01	0.01; 0.32	0.016
Waist Circumference	0.97	0.96; 0.99	0.001
PCS	0.96	0.93; 0.98	0.002
Constant	0.001		0.001
Height			
*Civil servants	1.00		0.099
*Business	1.04	1.01; 1.08	0.015
*Full-time housewife	0.99	0.97; 1.01	0.457
*Student	0.99	0.96; 1.02	0.485

Note: *Interaction; CI: confidence interval; PCS, Physical Composite Score.

DISCUSSION

The present study examined the characteristics and association of PLBP, physical activity and HRQoL in an urban population of pregnant women attending antenatal clinics in Northeastern Nigeria. In the context of this study, pregnancy-related LBP has been defined as any type of idiopathic pain arising between the 12th rib and the gluteal folds during the course of the pregnancy and was not attributed to a specific pathological condition such as a disc herniation.[20] There was a high prevalence of PLBP among pregnant women, which was associated with height, waist circumference and occupation. Also, PLBP was negatively associated with the physical well-being component of the overall HRQoL score.

The majority (54%) of the pregnant women in the present study indicated experiencing PLBP. This prevalence was comparable to 51% reported by Sturesson et al.[21], 52.5% by Ayanniyi et al.[4], 52.3% by Oyeyemi et al.[5], and 55.4% by Jimoh et al.[22] An overwhelming majority (75.8%) of the pregnant women reported worsening of PLBP with increased activities, a finding that is consistent with an earlier reported outcome.[22]

Our findings indicate that participating in occupational activities such as owning a business is associated with the occurrence of PLBP. However, findings from Yip et al.[23] and Oyeyemi et al.[5] showed no significant association between activities of daily living and PLBP. Conversely, a high incidence of PLBP throughout pregnancy has been found among women that engaged in work entailing a constrained work posture, prolonged periods of standing, lifting and twisting.[20,22,24,25] However, the present study does not consider the ergonomic standard of the work environment and working posture adopted in the occupations of the pregnant women assessed.

Pain intensity during pregnancy appears to fluctuate with most pregnant women reporting pains in the afternoon and night which are a period associated with intense ergonomic activity and postural nocturnal problems respectively, as predominant periods of pain, lasting for minutes to hours. It is believed that the prevalence of pain during these periods is related to musculoskeletal overload caused by maintenance of orthostatic or sitting positions.[26] Activities performed throughout the day could have caused tiredness and fatigue thereby resulting in greater afternoon and nighttime pain intensity. Moreover, joint and sacroiliac instability accompanied by ligament laxity would also be a possible cause of pain during periods of intense activity.[27] Thus, it is important for Allied Health practitioners involved with exercise planning and prescription to determine the pattern of activities in relation to timing and intensities of PLBP.

A greater portion (57.1%) of the participants reported moderate pain intensity, which was consistent with previous findings.[5,28,29] Also consistent with earlier findings[4,5] we found a higher proportion of lumbar type PLBP compared to sacroiliac type PLBP. The high incidence of lumbar PLBP may be related to biomechanical factors which alter normal lumbar mechanics. Support for this notion is evident in significant association observed between PLBP and a smaller waist-hip ratio in the present study. The waist-hip ratio has been widely used as an index of abdominal visceral adiposity, and body mass index for general body adiposity.[23] Therefore, it is not surprising that the present study shows that waist-hip ratio and height were the only anthropometric variables associated with PLBP. The occurrence of PLBP in this study can be linked to abdominal obesity that confers mechanical disadvantages and abnormal loads on the spine, thereby reducing shock absorbency.[30] Perhaps, height might not be the causative factor but rather the work-related scenarios involving tall women which are forced to endure an awkward or bent position, leading to an abnormal spinal alignment. Furthermore, it is well accepted that height is a risk factor for LBP. Thus, the interaction between height and working style may increase the probability of PLBP.

The trimester of pregnancy had no influence on the occurrence of PLBP, as PLBP prevalence was evenly distributed between groups (within the first = 58.62%, second = 48.36 and third trimesters 56.68%). However, Ostgaard and Andersson[31] reported a 25% increase in PLBP among women in the third compared to the first trimester. Inconsistency in prevalence rate between studies may be due to the unequal distribution of participants across trimesters. This may be attributed to the late booking of the pregnant women at the antenatal clinic. This was evident in the present study, as most of the participants were either in the second or third trimesters of pregnancy.

The HRQoL of pregnant women in the present study appear to be similar throughout pregnancy. This is consistent with the findings reported by Mourady et al.[32] who found no difference in the prevalence of PLBP across trimesters in both the physical and psychological (mental) heath domains of quality of life. However, our findings are inconsistent with those of Taylor et al.[33] who reported that several factors (e.g., sleep alteration, anxiety) affect quality of life of pregnant women as the pregnancy advances. As HRQoL during pregnancy is multifactorial, these inconsistencies may be due to individual differences such as the extent of insomnia and depression which are significantly associated with a decrease in all domains of QoL.[32]

Also, PLBP negatively affects the physical health domain and overall HRQoL but does not affect

the mental health domain. In many cases, low back pain leads to disability and interferes with normal locomotion[27] that may have a trade-off effect with regards to domain specific QoL (i.e., affecting the physical domain more than the mental domain). However, the lack of association between mental health and PLBP could be due to confirmation bias, as women often consider PLBP to be an inevitable, normal and transient source of discomfort during pregnancy.[34] Thus, it is often expected that PLBP will be spontaneously resolved postnatal, even without intervention. Perhaps this may explain the lack of psychological or mental disturbance associated with the pain.[3]

CONCLUSIONS

Among the sample of pregnant women studied, PLBP affects the physical well-being of the expecting mothers. While intensity and domain-specific physical activity were not associated with PLBP, the interaction of height and occupational activities was an important predictor of PLBP among a large cohort of pregnant women.

Strengths and Limitations of the Study. Our study is associated with various strengths. First, the use of a validated population-specific Pregnancy Physical Activity Questionnaire (PPAQ) with detailed physical activity domains and intensities. This added to the current limited knowledge on the effect of each physical activity domains and intensities on HrQoL and PLBP. Second, the recruitment of large number of pregnant women (*n*=398) in the study strengthens the external validity of our findings. However, some limitations need to be considered when interpreting the findings of our study. First, the study was conducted in a single healthcare centre, which may have a tendency of spectrum bias. Second, the subjectivity in the assessment of back pain through recall history may lead to bias. Third, though we expect the sample size to power the study, the use of data driven approach through individual variable test to arrive at significant factors for the model may decrease the study power.

Individual author's contributions

AL contributed to the study conception, design, data collection, analysis and draft of the manuscript. AAW contributed with intellectual revision for the study design, analysis and critical revision of the manuscript. UMB contributed to data analysis and critical revision of the manuscript. CMI contributed with data cleaning and revision of the manuscript. MAM contributed with revision of the manuscript. AAR contributed to study design and critical revision of the manuscript. AM contributed with the critical review and revision of the manuscript.

Disclosure statement

There is no funding for this project.

Conflicts of interest

The authors report no conflict of interest.

Acknowledgement

The Authors would like to acknowledge Mr. Tiev Miller for assisting with language and technical editing of the manuscript.

References:

1. Soma-Pillay P, Catherine N-P, Tolppanen H, Mebazaa A, Tolppanen H, Mebazaa A. Physiological changes in pregnancy. Cardiovascular Journal of Africa. 2016;27(2):89-94. DOI: 10.5830/CVJA-2016-021.
2. Lopes RC, Prochnow LP, Piccinini CA. Mother's Relationship with Female Support Figures. Psicologia em Estudo. 2010;15(2):295-304.
3. Katonis P, Kampouroglou A, Aggelopoulos A, Kakavelakis K, Lykoudis S, Makrigiannakis A, et al. Pregnancy-related low back pain. Hippokratia. 2011;15(3):205-210.
4. Ayanniyi O, Sanya A, Ogunlade S, Oni-Orisan M. Prevalence and pattern of back pain among pregnant women attending ante-natal clinics in selected health care facilities. African Journal of Biomedical Research. 2006;9(3):149-156. DOI: 10.4314/ajbr.v9i3.48898 .
5. Oyeyemi A, Rufa'i A, Aliyu L. Low back pain incident, anthropometric characteristics and activities of daily living in pregnant women in a teaching hospital center antenatal clinic. Tropical Journal of Obstetrics Gynaecology. 2013;30(1):29-37.

6. Mens JM, Vleeming A, Stoeckart R, Stam HJ, Snijders CJ. Understanding peripartum pelvic pain: implications of a patient survey. Spine. 1996;21(11):1363-1369.
7. Sabino J, Grauer JN. Pregnancy and low back pain. Current Reviews in Musculoskeletal Medicine. 2008;1(2):137-141. DOI: 10.1007/s12178-008-9021-8.
8. Brynhildsen J, Hansson Å, Persson A. Follow-up of patients with low back pain during pregnancy. Obstetrics and Gynecology. 1998;91(2):182-186. DOI: 10.1016/S0029-44(97)006303.
9. Vermani E, Mittal R, Weeks A. Pelvic girdle pain and low back pain in pregnancy: a review. Pain Practice. 2010;10(1):60-71. DOI: 10.1111/j.1533-2500.2009.00327.x.
10. Aydın Ü, Eser F, Garip Y. Impact of functional status on the quality of life of pregnant women with lumbopelvic pain. Istanbul Medical Journal. 2015;16(2):70-72. DOI: 10.5152/imj.2015.02259.
11. Çoban A, Arslan GG, Çolakfakioglu A, Sirlan A. Impact on quality of life and physical ability of pregnancy-related back pain in the third trimester of pregnancy. Environment. 2011;114(088):136.
12. Calou CG, Pinheiro AK, Castro RC, Oliveira MFd, Aquino PdS, Antezana FJ. Health related quality of life of pregnant women and associated factors: An integrative review. Health (Irvine). 2014;6:2375-2387.
13. Escudero-Rivas R, Carretero P, Ca A, Cruz M, Florido JJH. Modifications of sexual activity during uncomplicated pregnancy: A prospective investigation of Spanish women. Scientific Research. 2013;5(8):1289-1294. DOI: 10.4236/health.2013.58175.
14. Mogos MF, August EM, Salinas-Miranda AA, Sultan DH, Salihu HMJAriqol. A systematic review of quality of life measures in pregnant and postpartum mothers. Applied Research Quality of Life. 2013;8(2):219-250. DOI:10.1007/s11482-012-9188-4.
15. Lawan A, Awotidebe WA, Oyeyemi AL, Oyeyemi AY. Patterns and predictors of physical activity among pregnant women in northeast Nigeria. African Journal for Physical Activity and Health Sciences (AJPHES). 2017;23(4):549-562.
16. Xu G. Estimating sample size for a descriptive study in quantitative research. Quirk's Marketing Research Review. 1999;1.
17. Cheak-Zamora NC, Wyrwich KW, McBride TD. Reliability and validity of the SF-12v2 in the medical expenditure panel survey. Quality of Life Research. 2009;18(6):727-735. DOI: https://doi.org/10.1007/s11136-009-9483-1.
18. Lawan A, Awotidebe AW, Oyeyemi AL, Rufa AA, Oyeyemi AY. Relationship between physical activity and health related quality of life among pregnant women. African Journal of Reproductive Health. 2018;22(3):80-89.
19. Tabachnick B, Fidell L. Using multivariate statistics. 4th ed. New York: Harper Collins. 2001.
20. Sneag DB, Bendo JA. Pregnancy-related low back pain. Orthopedics. 2007;30(10):839-845. DOI: 10.3928/01477447-20071001-14.
21. Sturesson B, Udén G, Udén A. Pain pattern in pregnancy and" catching" of the leg in pregnant women with posterior pelvic pain. Spine. 1997;22(16):1880-1883.
22. Jimoh G, Omokanye L, Salaudeen A, Saidu R, Saka MJ, Akinwale A, et al. Prevalence of low back pain among pregnant women in Ilorin, Nigeria. Medical Practice and Review. 2013;4(4):23-26.
23. Yip Y, Ho S, Chan S. Tall stature, overweight and the prevalence of low back pain in Chinese middle-aged women. International Journal of Obesity. 2001;25(6):887-892. DOI: 10.1038/sj.ijo.0801557
24. Berg G, Hammar M, Möller-Nielsen J, Lindén U, Thorblad J. Low back pain during pregnancy. Obstetrics and Gynecology. 1988;71(1):71-75.
25. Endresen EH. Pelvic pain and low back pain in pregnant women–an epidemiological study. Scandinavian Journal of Rheumatology. 1995;24(3):135-141. DOI: 10.3109/03009749509099301.
26. Martins RF, Silva JL. Prevalência de dores nas costas na gestação. Revista da Associação Médica Brasileira. 2005;51(3):144-147. DOI: 10.1590/S0104-42302005000300014.
27. Albert HB, Godskesen M, Westergaard JG. Incidence of four syndromes of pregnancy-related pelvic joint pain. Spine. 2002;27(24):2831-2834.
28. Ansari NN, Hasson S, Naghdi S, Keyhani S, Jalaie S. Low back pain during pregnancy in Iranian women: Prevalence and risk factors. Physiotherapy Theory and Practice. 2010;26(1):40-48. DOI: 10.3109/09593980802664968.
29. Fast A, Weiss L, Parikh S, Hertz G. Night backache in pregnancy. Hypothetical pathophysiological mechanisms. American Journal of Physical Medicine and Rehabilitation. 1989;68(5):227-229. DOI: 10.1097/00002060-198910000-00005.
30. Han T, Schouten J, Lean M, Seidell J. The prevalence of low back pain and associations with body fatness, fat distribution and height. International Journal of Obesity. 1997;21(7):600-607. DOI: 10.1038/sj.ijo.0800448.
31. Ostgaard H, Andersson G. Previous back pain and risk of developing back pain in a future pregnancy. Spine. 1991;16(4):432-436. DOI: 10.1097/00007632-199104000-00008.
32. Mourady D, Richa S, Karam R, et al. Associations between quality of life, physical activity, worry, depression and insomnia: A cross-sectional designed study in healthy pregnant women. PloS One. 2017;12(5):1-15. DOI: 10.1371/journal.pone.0178181.

33. Taylor DJ, Mallory LJ, Lichstein KL, Durrence HH, Riedel BW, Bush AJ. Comorbidity of chronic insomnia with medical problems. Sleep. 2007;30(2):213-218. DOI: 10.1093/sleep/30.2.213.

34. Mogren IM, Pohjanen AI. Low back pain and pelvic pain during pregnancy: prevalence and risk factors. Spine. 2005;30(8):983-991. DOI: 10.1097/01.brs.0000158957.42198.8e.