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Relationship Between Physical Activity and Fatigue Among Nigerian Pregnant Women

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Abstract

Background: Physical inactivity and fatigue are two common phenomena in pregnancy with attendant negative consequences. However, reports on the nexus between physical activity (PA) and fatigue seems to be sparse in literature.
Objectives: This study evaluated levels and correlation between PA and pregnancy-related fatigue among Nigerian pregnant women.
Methods: This cross-sectional study involved 189 consenting pregnant women from five selected health facilities in Osun State, south west, Nigeria, yielding a response rate of 94.5%. PA and fatigue were assessed using the pregnancy physical activity questionnaire and fatigue symptoms checklist over a three-month period (July to September, 2016). Data was analyzed using descriptive and inferential statistics. Significant level was set at $P < 0.05$.
Results: The mean age of respondents in this study was 29.8 $\pm$ 5.11 years. The highest and least form of PA was household (1263 $\pm$ 633.4) and vigorous intensity (6.4 $\pm$ 6.8) PA. Fatigue was most severe in the third trimester of the pregnancy (48.7 $\pm$ 11.7) and least in the second trimester (43.7 $\pm$ 8.1). There was a significant difference in the fatigue scores across trimesters of pregnancy ($P = 0.042$), while there was no significant difference in the PA scores across trimesters of pregnancy ($P > 0.05$). There was a significant relationship between total PA and fatigue ($r = 0.195$; $P = 0.009$).
Conclusions: Nigerian pregnant women seem averred to vigorous intensity, occupational, and sports related PA; however, they are mostly involved in light intensity and household physical activity. Pregnancy-related fatigue is dominant in the third trimester and least severe in the second trimester. There is significant relationship between pregnancy-related fatigue and physical activity except sedentary, moderate intensity, and occupational physical activity.

Keywords: Physical Activity, Fatigue, Pregnancy, Nigeria

1. Background

Pregnancy is a period in women's lives that is associated with significant physiological and psychological changes (1). Specifically, pregnancy predisposes and promotes a sedentary lifestyle with an attendant low level of physical activity (PA) (1). Studies have attributed pregnancy-induced high gestational weight gain, obesity, Type 2 diabetes, hypertension, and cardiovascular disease, as well as, increased long-term risk of body weight to pregnancy-related sedentary behavior (2-5). Unfortunately, there is an aphathy for PA in pregnancy, as a considerable number of women stop or reduce their general PA level once they discover they are pregnant, in the same vein, only few participate in exercise or sport activities during pregnancy (6). Consequently, physical inactivity during pregnancy continues to fester the development of preventable conditions such as hypertension and preeclampsia, maternal obesity, and gestational diabetes (7).

In addition to the foregoing, commonly associated with pregnancy is fatigue (8), it is often reported that women feel more tired most commonly during the first and the third trimester (6). Pregnancy-related fatigue

has been linked with caesarean deliveries (9). Furthermore, consequential to maternal fatigue is early labor onset, poor fetal development, and poor child and motor and mental development (10, 11). Furthermore, fatigue has been associated with poor recovery after childbirth as well as physical challenges with care for the new baby (12). However, the cause and effect of fatigue seems to vary with different individuals. Despite that fatigue and sedentary behaviors are major issues among pregnant women; however, how both constructs influence one another is still largely unexplored.

2. Objectives

Thus, this study was aimed to evaluate levels and correlation between PA and perinatal fatigue among Nigerian pregnant women.

3. Methods

This cross-sectional study purposively recruited pregnant women from five selected facilities namely, Comprehensive Health Centre, Aderemi; Obafemi Awolowo University (OAU) Health Centre; OAU Teaching Hospital Complex; Primary Health Centre; Seventh Day Adventist Hospital; and Urban Comprehensive Health Centre in Ile-Ife, Osun State, Nigeria. The study was conducted over a three-month period (July to September, 2016). A correlation sample size by Hulley et al. (13), ($N = [(Z_\alpha + Z_\beta)/C]^2 + 3$) was used in this study where N is the total sample size; Z_α is the standard normal deviate for α at $P < 0.05$x (i.e. = c); Z_β is the standard normal deviate for β at 0.02 (i.e. 0.842); r is the expected correlation coefficient (0.200); $C = 0.5 \times \ln[(1+r)/(1-r)]$ (i.e. 0.203). A sample of 194 was calculated (i.e. $[(0.203 + 0.842)/0.203]^2 + 3$). In order to allow for missing and incomplete data and attrition, the calculated sample size was rounded off to 200. However, a total of 189 pregnant women participated in this, yielding a response rate of 94.5% (i.e. $189/200 \times 100$). Nonetheless, only data from 178 of the participants were found valid for analysis.

Pregnant women with reported underlying pathologies like diabetes or hypertension were excluded from the study. Ethical approval for the study was obtained from the Ethics and Research Office in the OAU Teaching Hospitals Complex. The purpose of the research was explained to each respondent and informed consent for participation was obtained.

3.1. Instrument

3.1.1. Pregnancy Physical Activity Questionnaire (PPAQ)

The PPAQ developed by Chasan-Taber et al., was used in this study. The PPAQ consists of 33 questions assessing different day to day activities and how much time is spent doing each of the activities. To score the questionnaire, the total duration was multiplied by seven. Computation of PPAQ was as described by Chasan-Taber et al. The measure of average weekly energy expenditure (MET-h'week-1) was calculated as a product of duration of time spent in each activity and its intensity. Based on the Chasan-Taber et al., scoring guidelines, PA in pregnancy was calculated as total activity, sedentary, light-intensity activity, moderate-intensity activity, vigorous-intensity, household/caregiving activity, occupational activity, and sports/exercise, respectively (14).

3.1.2. Fatigue Symptoms Checklist (FSC)

The FSC is a 30-item checklist of symptoms of mental, physical, and overall fatigue. Although, the FSC was originally developed to assess perceived fatigue among persons in the manufacturing industry, it was later modified and validated for use in postpartum women. The FSC is ranked on a likert scale of 1 (being not at all) to 4 (very much). Scores on the FSC ranges from 13 - 20, where higher scores indicate a higher level of fatigue. Standard deviation of FSC scores regarding the mean was typically used to classify fatigue into high, medium, and low intensity, respectively (15). More than one standard deviation below the mean, within one standard deviation above or below the mean, and more than one standard deviation above the mean of the sample was classified as low, medium, and high fatgue, respectively (15).

3.2. Data Analysis

Descriptive statistics of mean, standard deviation, and frequency were used to summarize data. Inferential statistics of Chi-square test of association, Pearson's product moment correlation, and analysis of variance (ANOVA) were used. Signficant level was set to $P < 0.05$.

4. Results

The mean age of the respondents in this study was 29.8 $\pm$ 5.11 years. The respondents were mostly public servants (37.1%) and of the Christian religion (80.3%) (Table 1). Most of the respondents (68.5%) were in their third trimester and worked during their pregnancy (84.8%). None of the

Table 1. Socio-Demographic and Clinical Characteristics of the Respondents

Variable	No. (%)
Socio-demographic characteristics	
Marital status	
Married	161 (90.4)
Widowed	14 (7.9)
Single, never married	3 (1.7)
Occupation	
Civil/public service	66 (37.1)
Trading/business	58 (32.6)
Artisan	15 (8.4)
Unemployed	12 (6.7)
No information	27 (15.2)
Religion	
Christianity	143 (80.3)
Islam	35 (19.7)
Ethnic	
Yoruba	150 (84.3)
Igbo	13 (7.3)
Hausa	1 (0.6)
Others	14 (7.9)
Clinical characteristics	
Trimester	
1st trimester	13 (7.3)
2nd trimester	43 (24.2)
3rd trimester	122 (68.5)
Work during pregnancy	
Yes	151 (84.8)
No	27 (15.2)
Hypertensive	
Yes	0 (0)
No	178 (100)
Diabetic	
Yes	2 (1.1)
No	176 (98.9)

respondents were hypertensive and only 1.1% were diabetic (Table 1).

The mean and percentile values on PA among the respondents is presented in Table 2. The PA type with the highest mean was the household PA (1263.6 $\pm$ 633.4) while the PA type with the lowest mean was vigorous intensity PA (6.4 $\pm$ 6.8). The PA with the lowest number of respondents was the sedentary with 130 respondents. Moderate intensity, occupational, and sports PA were the type of PA mostly performed by the respondents (Table 2). Table 3 shows the mean values and percentile data on PA across the three trimesters of pregnancy. Of the three trimesters, the third has the highest overall mean of 1288.8 $\pm$ 567.0 in household related PA. The second trimester contained the lowest mean of 4.7 $\pm$ 5.3 in vigorous intensity PA. The mean of participation was highest in the second trimester (1438.2 $\pm$ 759.0). The occupational PA in the second trimester was also highest (10.9 $\pm$ 10.0).

Table 4 represents the mean values and percentile data on fatigue scores among pregnant women. The third trimester fatigue score was the highest (48.7 $\pm$ 11.7) while the least score was observed in the second trimester (43.7 $\pm$ 8.1). Comparison of PA and pregnancy-related fatigue across the different trimesters of pregnancy is presented in Table 5. There were no significant differences in the PA scores across the different trimesters of pregnancy ($P > 0.05$); however, there was significant difference in fatigue score ($P = 0.042$) across different trimesters of pregnancy.

Most respondents in the third trimester of pregnancy reported high fatigue (80%). There was no significant association between levels of PA and fatigue level ($P > 0.05$) (Table 6). There was significant correlation between fatigue and light intensity PA ($r = 0.173$, $P = 0.035$), vigorous intensity PA ($r = 0.160$, $P = 0.040$), household PA ($r = 0.167$, $P = 0.040$), and sports PA ($r = 0.152$, $P = 0.043$). However, there was no significant correlation between the other PAs (sedentary, moderate intensity, and occupational PA ($P > 0.05$)) (Table 7).

5. Discussion

This study assessed the relationship between PA and fatigue among pregnant women. The volunteer pregnant women were relatively young. Thus, the co-founding effect of age on PA and fatigue relationship in this study is limited as most of the pregnant women were within a small age bracket. Studies have shown that age significantly influences PA. One study conducted by Bongard et al. revealed that there is a decline in performance with increasing age and the decline seems to be constant and somewhat uninfluenced by other factors, for example sex. Age has been considered as a co-founder in many PA studies (16, 17). Specifically, studies on PA in pregnancy have shown that physical functions were consistently decreased with increased age in elderly women (17). Since the respondents in this study were within a small age bracket, it is adducible

Table 2. Mean Values and Percentile Data on Total Physical Activity

Variable	Valid	Missing	Mean ± SD	Median	Minimum	25%	50%	75%	95%	Maximum
Sedentary	130	48	71.7 ± 37.6	71.5	0.00	39.5	71.5	93.2	131.7	185.5
Light intensity	149	29	1231.6 ± 605.5	1148.7	13.8	1084.8	1148.7	1832.6	2256.1	2283.9
Moderate intensity	178	0	109.9 ± 68.5	97.8	0.00	58.6	97.6	145.7	245.9	346.7
Vigorous intensity	165	13	6.4 ± 6.8	4.9	0.00	1.6	4.9	10.1	20.3	37.0
Household	152	26	1263.6 ± 633.4	1167.7	9.5	1083.4	1167.7	1874.0	2275.9	2466.0
Occupational	178	0	10.7 ± 10.2	7.3	0.00	2.6	7.3	14.8	29.0	67.0
Sports	178	0	18.6 ± 15.7	16.5	0.00	7.6	16.5	27.2	42.2	128.3
Total PA	178	0	1367.0 ± 685.3	1283.2	53.2	1116.1	1283.2	2007.5	2846.9	2678.5

Table 3. Mean Values and Percentile Data on Physical Activity by Pregnancy Trimesters

Variable	Valid	Missing	Mean ± SD	Median	Minimum	25%	50%	75%	95%	Maximum
First trimester										
Sedentary	14	10	91.4 ± 40.2	86.5	22.9	73.2	86.	118.3	178.5	178.5
Light intensity	18	6	1218.7 ± 734.2	1131.9	60.7	597.0	1131.9	1936.0	2282.7	2282.7
Moderate intensity	24	0	99.5 ± 65.9	85.5	16.4	42.2	85.5	153.2	256.8	284.2
Vigorous intensity	20	4	6.4 ± 7.5	3.3	0.0	0.4	3.3	11.1	21.0	21.0
Household	20	4	1214.9 ± 753.0	1130.9	1130.9	592.0	1120.9	1966.0	2308.7	2310.7
Occupational	24	0	10.4 ± 15.3	2.9	0.0	0.3	2.9	14.8	58.0	67.0
Sports	24	0	16.9 ± 15.1	15.9	0.00	2.9	15.9	26.4	52.8	52.8
Total PA	24	0	1184 ± 836.5	1240.2	70.4	319.9	1240.2	2111.3	2532.8	2546.2
Second trimester										
Sedentary	32	11	68.0 ± 37.6	75.0	0.00	30.6	75.0	91.0	137.6	172.2
Light intensity	38	5	1213.9 ± 714.2	1157.4	13.8	552.9	1157.4	1838.2	2274.7	2274.7
Moderate intensity	43	0	107.9 ± 63.3	97.8	2.3	64.6	97.8	148.5	241.4	245.9
Vigorous intensity	39	4	4.7 ± 5.3	3.4	0.0	0.0	3.4	6.6	15.4	17.5
Household	38	5	1227.0 ± 729.8	1169.5	9.5	565.8	1169.5	1857.8	2271.2	2291.6
Occupational	43	0	10.9 ± 10.0	7.9	0.0	2.6	7.9	17.6	33.5	35.3
Sports	43	0	15.4 ± 11.7	13.0	0.0	1.5	13.0	26.7	33.3	36.2
Total	43	0	1438.2 ± 759.0	1377.2	53.8	775.4	1377.2	2032.2	2481.4	2537.6
Third trimester										
Sedentary	84	27	69.8 ± 36.9	63.7	6.8	38.5	63.7	94.0	132.0	185.5
Light intensity	93	18	1241.4 ± 533.6	1153.1	89.1	1093.8	1153.1	1816.2	2244.0	2283.9
Moderate intensity	111	0	112.9 ± 71.2	100.7	0.0	60.4	100.7	145.7	248.6	346.7
Vigorous intensity	106	5	112.9 ± 7.1	4.9	0.0	1.6	4.9	10.8	20.3	37.0
Household	94	17	1288.8 ± 567.0	1170.3	105.7	1093.3	1170.3	1877.0	2304.7	2466.1
Occupational	111	0	10.7 ± 8.9	7.4	0.0	4.5	7.4	14.6	27.8	46.9
Sports	111	0	20.3 ± 17.1	16.7	0.0	8.0	16.7	29.8	42.9	128.3
Total	111	0	1378.8 ± 616.4	1296.6	84.1	1148.5	1296.6	19714	2437.5	2678.5

that the study's findings on PA can be attributed to effect pregnancy with little or no contribution of age.

From this study, the pregnant women had a high household PA (1263.6 ± 633.4) and low vigorous intensity

Table 4. Mean Values and Percentile Data on Pregnancy-Related Fatigue

Variable	Valid	Missing	Mean ± SD	Median	Minimum	25%	50%	75%	95%	Maximum
First trimester	24	0	47.6 ± 10.6	44.4	30.0	39.5	44.4	56.5	69.2	69.2
Second trimester	43	0	43.7 ± 8.1	42.7	31.1	39.2	42.7	46.2	66.8	68.0
Third trimester	111	0	48.7 ± 11.7	48.5	28.9	39.2	48.5	57.7	70.3	84.2
Total	178	0	47.4 ± 11.0	45.6	28.9	39.2	45.6	54.2	69.2	84.2

Table 5. Comparison of Fatigue and Physical Activity Scores Across Different Trimester of Pregnancy

Variable	n	Trimester[a]			F Ratio	P Value
		1st	2nd	3rd		
Fatigue						
Fatigue score	178	47.6 ± 10.6	43.8 ± 8.1	48.7 ± 11.8	3.220	0.042
Physical activity						
Sedentary	130	91.4 ± 40.2	68.0 ± 37.6	69.8 ± 36.9	2.206	0.114
Light intensity	149	1218.7 ± 734.2	1213.9 ± 714.2	1241.4 ± 533.6	0.032	0.969
Moderate intensity	178	99.5 ± 65.9	107.9 ± 63.3	112.9 ± 71.2	0.400	0.671
Vigorous intensity	165	6.4 ± 7.5	4.7 ± 5.3	7.0 ± 7.1	1.664	0.193
Household	152	1214.9 ± 753.0	1227.0 ± 730.0	1288.8 ± 567.0	0.195	0.823
Occupational	178	10.4 ± 15.2	10.9 ± 10.0	10.7 ± 9.0	0.018	0.983
Sports	178	16.9 ± 15.1	15.4 ± 11.7	20.3 ± 17.1	1.701	0.185
Total PA score	178	1184.3 ± 836.5	1438.2 ± 759.0	1378.8 ± 616.4	1.103	0.334

[a] Values are expressed as mean ± SD.

Table 6. Chi-Square Test of Association Between Fatigue and Physical Activity in Pregnancy

Variable	Fatigue Level[a]			$\chi 2$	P Value
	Low	Moderate	High		
Stage of pregnancy					
1st trimester	3 (10.7)	17 (14.2)	4 (13.3)	6.868	0.143
2nd trimester	9 (32.1)	32 (26.7)	2 (6.7)		
3rd trimester	16 (57.1)	71 (59.2)	24 (80)		
Total	28 (100)	120 (100)	30 (100)		

[a] Values are expressed as No. (%).

PA (6.4 ± 6.8) (Table 2). High household PA has been reported in some studies on the prevalence of high household PA levels. One of such was a research conducted by Florindo et al. who found that household PA is the most prevalent PA in comparison to occupational and transportation PA (18). Household PA was found by them to be the highest of all reviewed PA types among the pregnant participants of the study. With regards to vigorous intensity PA, van der Wijden et al. found that the PA type decreased significantly in pregnant women as compared to their non-pregnant counterparts (19).

Both the mean of participation and the occupational PA were highest in the second trimester. This finding is congruous with the reports of Borodulin et al. who also recorded high levels of PA during the second trimester of pregnancy. While they found that PA levels were high in the second trimester, they dwindled in the other trimesters (20). Therefore, the findings of this study supports earlier assertions that PA is usually highest during the second trimester. This unique PA pattern has been reported by many authors to be due to the low fatigue experienced during this trimester of pregnancy (21, 22). Essentially, the

Table 7. Pearson's Product Moment Correlation Between Physical Activity and Fatigue

Variables	r	P Value
Sedentary	0.033	0.708
Light intensity	0.173	0.035[a]
Moderate intensity	0.076	0.310
Vigorous intensity	0.160	0.040[a]
Household	0.167	0.040[a]
Occupational	0.069	0.362
Sports	0.152	0.043[a]
Total PA	0.194	0.009[a]

[a] Indicate significance at $P < 0.05$.

PA levels seem to decline, increase, and then decline once more, with the third trimester marked by the lowest PA level in the entire pregnancy cycle, followed closely by the first trimester. This inference was also drawn by Borodulin et al. (20).

From this study, the third trimester had the highest mean fatigue score while the least mean score was observed in the second trimester. Pourjavad and Mansoori (21) conducted a similar research and found that contrary to the results of this study, the respondents of their study experienced the highest fatigue in the first trimester of pregnancy. This is possibly due to the fact that the respondents partook mostly in household type PA. Contrary still, respondents in Pourjavad and Mansoori's study were all occupationally active during their first trimester. The common point between these two studies, however, is the fact that the second trimester has the lowest fatigue levels. Chou et al. (22), reached the same conclusion that the second trimester has the lowest fatigue levels.

This study also showed that there is a significant relationship between fatigue and total PA of the respondents in the study. Various sudies have documented the same findings (9, 19, 23). Specifically, Murphy et al. stated that fatigue is a robust and important variable when the topic of PA is discussed. It significantly influences PA in a negative manner. They reported that it is associated with decreased PA (23).

Furthermore, from this study, a significant correlation was found between fatigue and some types of PA. Earlier studies reported similar findings on significant correlation between fatigue and PA types; specifically, Murphy et al. (23), who concluded that fatigue correlated very strongly with PA. Notably, light intensity and household intensity PA correlate signficantly with fatigue. Muphy et al. (23), stressed that performance of common everyday activity can be significantly affected by fatigue. Another study found that fatigue influenced sports related PA (24). The authors found that regardless of skill, experience, or expertise, fatigue greatly reduced the performance of participants (24). A potential limitation of this study is that perinatal fatigue alone was explored. Thus, the outcome of this study cannot be extrapolated to other forms of maternal fatigue or chronic fatigue syndrome that may be found in pregnant women also. Limited generalizability of finding is owing to the fact that different types of fatigues are precipitated and perpetuated differently. For example, anxiety, prenatal depression, fear of childbirth during pregnancy, preterm birth and cesarean section, as well as, postpartum expectations have been implicated in the aetiology of prenatal fatigue (25-27). On the other hand, postpartum fatigue is associated with postpartum depression and sleep dissatisfaction, which are common experiences of women after delivery (28, 29). Therefore, further studies are needed to explore the nexus between PA and other forms of fatigue, as understanding fatigue experienced at the different stages of pregnancy, perinatal, and postpartum can help in the management of maternal fatigue during pregnancy and postpartum.

5.1. Conclusions

Nigerian pregnant women seem averred to vigorous intensity, occupational, and sport related PA; however, they are mostly involved in light intensity and household physical activity. Pregnancy-related fatigue is dominant in the third trimester and least severe in second trimester. There is a significant relationship between pregnancy-related fatigue and physical activity, except sedentary, moderate intensity, and occupational physical activity.

Footnotes

Authors' Contribution: Conception of study idea: Chidozie Emmanuel Mbada; data collection: Ademola Matthew Iyiola; data analysis: Chidozie Emmanuel Mbada; interpretation of findings: Chidozie Emmanuel Mbada, Okechukwu Ernest Orji, Ademola Matthew Iyiola, Adebanjo Babalola Adeyemi, Esther Kikelomo Afolabi, Ojukwu Chidiebele Petronilla, Abolaji Blessed Adeyemi, Olabisi Aderonke Akinwande and Moses Oluwatosin Makinde; writing of manuscript: Chidozie Emmanuel Mbada, Okechukwu Ernest Orji, Ademola Matthew Iyiola, Adebanjo Babalola Adeyemi, Esther Kikelomo Afolabi, Ojukwu Chidiebele Petronilla, Abolaji Blessed Adeyemi, Olabisi

Aderonke Akinwande and Moses Oluwatosin Makinde; review of manuscript: Chidozie Emmanuel Mbada, Okechukwu Ernest Orji, Ademola Matthew Iyiola, Adebanjo Babalola Adeyemi, Esther Kikelomo Afolabi, Ojukwu Chidiebele Petronilla, Abolaji Blessed Adeyemi, Olabisi Aderonke Akinwande and Moses Oluwatosin Makinde.

Ethical Considerations: Ethical approval for the study was obtained from the Ethics and Research Office in the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria.

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