**ORIGINAL RESEARCH ARTICLE**

# Physical Activity and Energy Expenditure: Findings from the Ibadan Pregnant Women's Survey

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## Abstract

Physical activity, if there are no medical caveats, is beneficial to all people including pregnant women. This study examined the level of physical activity in a group of pregnant Nigerian women. Pregnancy Physical Activity Questionnaire was used to assess the physical activity of 453 pregnant women. The mean age of participants was 30.89±4.44 years, 222 (49.0%) were sedentary, and only 46 (10.2%) presented with moderate activity level. The highest amount of energy (75.9 MET-h·wk$^{-1}$) was expended on household activities. Women in the third trimester of pregnancy had more than three times the risk of being sedentary (OR=3.26, 95% CI = 2.11-4.56) but the risk reduced by 58% in gravid ≥5 women. Most of the pregnant women recorded physical activity that was lower than the recommended level, which could lead to unfavourable health outcomes for mother and child. Efforts to promote physical activity in pregnant women in this environment are desirable. *Afr J Reprod Health 2014; 18[2]: 117-126).*

**Keywords:** Physical activity, Energy expenditure, Pregnancy, Maternal health promotion

## Résumé

S'il n'y a pas de mises en garde médicales, l'activité physique est bénéfique pour toutes les personnes y compris les femmes enceintes. Cette étude a examiné le niveau d'activité physique dans un groupe de femmes nigérianes enceintes. Un questionnaire basé sur l'activité physique a été utilisé pour évaluer l'activité physique de 453 femmes enceintes. L'âge moyen des participants était de 30,89 ± 4,44 ans, 222 (49,0%) étaient sédentaire, et seulement 46 (10,2%) ont présenté avec le niveau d'activité physique modéré. Le montant le plus élevé de l'énergie (75,9 MET-h• sem - 1) ont été consacrés aux activités ménagères. Les femmes dans le troisième trimestre de la grossesse courent plus de trois fois le risque d'être sédentaire (OR = 3,26, IC 95% 2,11 à 4,56 =) mais le risque se réduit de 58% en gravides ≥ 5 femmes. La plupart des femmes enceintes ont enregistré l'activité physique qui était inférieur au niveau recommandé, ce qui pourrait conduire à des résultats défavorables sur la santé de la mère et de l'enfant. il est souhaitable d'avoir des efforts pour promouvoir l'activité physique chez les femmes enceintes dans cet environnement. *Afr J Reprod Health 2014; 18[2]: 117-126).*

**Mots-clés**: activité physique, dépenses d'énergie, grossesse, promotion de la santé maternelle

## Introduction

Physical activity when performed at recommended levels during pregnancy has benefits both for the mother and the child[1]. At least 30 minutes of moderate activity or 8000 steps/day equivalent to approximately 7.5 MET-h/wk are recommended for beneficial results[2-3]. In the forefront of the benefits accruable from physical activity is the prevention and control of a host of medical disorders that may be potentially harmful to both the mother and the child. There is consistent evidence that promoting physical activity in women of reproductive age may be a promising approach for the prevention of excessive weight gain, gestational diabetes mellitus and subsequent complications suffered by children born from pregnancies affected by gestational diabetes mellitus[1,4-5]. Excessive gestational weight gain exists in appreciable proportions in Nigeria and it is associated with maternal complications such as the need for Cesarean delivery, hypertension, preeclampsia, impaired glucose tolerance, and gestational diabetes mellitus; all of which increase maternal and perinatal mortality[6-7]. However, a review of the literature has shown that aerobic exercise can control maternal weight among pregnant women and a study conducted on pregnant Nigerian women shows that aerobic exercise can also reduce the fatigue and insomnia

experienced during pregnancy[8-9]. In addition, was observed that triglyceride concentration and total cholesterol reduced in women who spent the highest amount of time in physical activity and energy expenditure suggesting that regular physical activity may attenuate pregnancy-associated dyslipidaemia[10]. Research has also suggested that regular physical activity, particularly when performed in the year preceding pregnancy and during early pregnancy, is associated with a reduced risk of preeclampsia[11].

Although recommended level of physical activity is beneficial, it may not be perceived as appropriate or feasible[5]. Even in the absence of medical or obstetric complications, maintaining or increasing physical activity during pregnancy is difficult[12]. McParlin et al observed that there is little information on physical activity levels in pregnant women, but Chasan-Taber reported that studies have consistently identified social isolation, safety concerns, and cultural norms as barriers to physical activity among an ethnic group of pregnant women[2,7]. Although most studies carried out on physical activity in pregnancy were conducted outside Africa, the present study was not conceptualized based on this geographical connotation but on the more pressing issue of understanding the actual level of physical activity that is undertaken by a cross-section of pregnant Nigerian women. In addition, since studies have already revealed the benefit of physical activity among pregnant Nigerian women, there is a further need to investigate whether the pregnant women are active at recommended levels[6,9]. This study was considered to be of importance because of its potential usefulness in generating previously unavailable data on levels of physical activity among pregnant Nigerian women and to proffer attainable help for the enhancement of physical activity among a group of pregnant Nigerian women.

# Method

### *Participants*

The participants for this cross-sectional study were pregnant women attending the antenatal clinics of the three tertiary health facilities in Ibadan, Oyo State of Nigeria, namely University College Hospital, Adeoyo Maternity Teaching Hospital, and Our Lady of Apostle Catholic Hospital. The hospitals were purposively selected based on the authors' prior knowledge that the hospitals will have the desired types of participants for the study. The participants were made up of a convenience sample of all consenting pregnant women in the hospitals who met the eligibility criteria. The eligibility criteria included willingness to give informed consent to participate in the survey, not being physically challenged, ability to read and/or understand Yoruba and English languages, and not being excluded from physical activity based on the advice of a doctor. During the recruitment phase, the prospective participants were given the opportunity to decide to participate or decline. This was after they had been informed and counseled about the study at previous meetings held with the participants on their appointments days. They were informed about the aims of the study and were counseled about their right to or not to participate and the need for them to seek help about any aspect of the questionnaire that was not clear to them. Those who missed the previous information and counseling sessions were offered the opportunity at the point of data collection. Data collection went on for 12 weeks during which a whole cycle of pregnant women visiting the three health facilities for antenatal services was completed. During the 14 weeks of contact (2 weeks of initial introduction of the study to the participants and the 12 weeks of data collection), a total of 671 pregnant women were recruited. However, by the end of the 12th week of data collection, only 453 pregnant women out of the 671 who were initially recruited participated in the physical activity survey. The total sample size of 453 therefore represents the number of participants who met the inclusion criteria. Because the study aimed at surveying all the pregnant women who presented at the clinics within the 12 weeks of data collection, the recruitment did not consider the participants along the line of their trimester; hence equal number of women in all the trimesters could not be attained. Each participant that took part in the study had her card marked to avoid re-enrollment and they were also asked to confirm if they had previously taken part in the survey.

***Questionnaires***

The main instrument that was used for data collection in this study was the Pregnancy Physical Activity Questionnaire (PPAQ)[13]. This is a pregnancy-specific questionnaire used to obtain self-reported data on the physical activity of pregnant women. Chasan-Taber et al had reported that the median values from the first administration of the PPAQ were comparable to the median values from the second administration of the PPAQ for total activity as well as across activity intensities and types[13]. The authors also reported a strong reproducibility between two administrations of the questionnaire (0.78 for total physical activity). Reproducibility was highest for moderate intensity activity (0.82) and ranged from 0.78 to 0.81 for light, sedentary and vigorous activity. While giving credence to self-reported measures of physical activity, Lindseth and Vari also reported that the results of pedometer and self-report exercise diary correlated significantly, with no significant differences in self-reported minutes of exercise or pedometer counts per day ($r = 49$, $p = 0.02$)[14]. An additional questionnaire was made available to the participants for documentation of selected clinical and socio-demographic characteristics including age of participant, gestational age, number of children, number of pregnancies carried to term, employment and educational status, and monthly income. There was also an informed consent form where the participants were introduced to the details of the research including justification and aims of the study. They were also assured of confidentiality.

Prior to the actual data collection, the PPAQ was translated into Yoruba language using standard procedures. Yoruba language was chosen because it is the major local language spoken by people in the study area. A pre-test of the PPAQ for content validity and test-retest reliability was carried out among 30 pregnant women – 10 for each trimester. For the pre-test, the questionnaire was administered on two different occasions with an interval of one week between the administrations and the scores were assessed for consistency. This was done to reveal areas where the participants were likely to face difficulty during the completion of the questionnaires especially with respect to question format, wording, order and reproducibility. For instance, the women had problem with the use of a mower which the original PPAQ asked; this was subsequently changed to the use of a hoe or cutlass. Ethical review and approval were sought and obtained from the University of Ibadan and University College Hospital Research Ethics Committee before the study commenced (Protocol ID: UI/EC/11/0029). Additional approval was obtained from Our Lady of Apostle Catholic Hospital, Ibadan. The support of the medical/health workers in charge of the antenatal clinics in the three hospitals was also achieved.

***Procedure for data collection***

The questionnaire pack was made up of the informed consent form, to which the participant appended her signature or fingerprint signifying consent to participate. This was followed by the socio-demographic section of the questionnaire and then the PPAQ. A total of 424 (93.6%) of the 453 questionnaires were self-administered by the respondents. The pregnant women who filled the remaining questionnaires were however assisted by having the questionnaires read to them either in Yoruba or English.

***Assessment of physical activity***

The PPAQ asked respondents to report the time spent participating in 32 activities including household/care giving (13 activities), occupational (5 activities), sports/exercise (8 activities), transportation (3 activities), and inactivity (3 activities). The levels covered were sedentary, light, moderate, vigorous, household/care-giving, occupational, sports/exercise; and the time frame of recall was the current trimester of pregnancy. At the concluding end of the PPAQ, an open-ended section allowed the respondent to add activities not already listed. Sleeping was not included. Calculations were computed as reported in detail by Chasan-Taber et a[13]. The compendium-based metabolic equivalent (MET) values were used to estimate the intensity of the PPAQ activities. For each activity, respondents were asked to select the category that best approximated the amount of time spent in that activity per day or week during the current trimester. The self-reported time spent

in each activity was multiplied by its intensity to arrive at a measure of an average weekly energy expenditure (MET-h·wk$^{-1}$) attributable to each activity. For every individual, the number of minutes spent in each reported activity type was multiplied by its MET intensity and summed to obtain the total daily energy expenditure. For example, for the occupational activity category: Occupational activity = sum of (duration X intensity) for questions #32, 33, 34, 35, 36. The daily estimates per subject were then averaged to calculate the average daily total energy expenditure in MET-hours per day (for "total energy score") and average daily activity-specific energy expenditure in MET-hours per day (for "activity-specific energy score"). Self-administration of the PPAQ took approximately 20 minutes. Chasan-Taber et al had earlier reported an average duration of about 10 minutes[13].

***Statistical analyses***

The socio-demographic and clinical data of the women including age, employment status, gravidity, among others were analysed and first presented as descriptive statistics. The physical activity level (sedentary, light, moderate and vigorous) and energy expenditure of the participants (in MET-h.week-1) for household, occupational and sports activities were also determined and presented using bar charts. Associations between the physical activity levels of the participants and some socio-demographic and clinical variables were determined using Chi squared and Spearman's rank order correlation analyses. Multiple regression analysis was also conducted to determine the factors that predict sedentary or moderate physical activity levels. Level of significance was set at p = 0.05. Statistical analyses were conducted using IBM SPSS Statistics version 20 (IBM Corporation, 2011).

# Results

***Socio-demographic characteristics of participants***

This study conducted on the physical activity of pregnant women comprised 453 pregnant women who were attending the antenatal clinics in the three major hospitals within the Ibadan metropolis. The mean age of the participants (Table 1) was 30.89 ± 4.44 years (range: 17 to 42 years). About half (49.9%) of them were in their third trimester as at the data collection period; 32 (7.1%) were at least a gravid 5 and 199 (43.9%) were nulliparous. Equal proportions (42.8%) of the women were either self-employed or engaged in paid employment. Other details on educational levels and total monthly income are presented in Table 2.

**Table 1:** Clinical and socio-demographic characteristics of participants

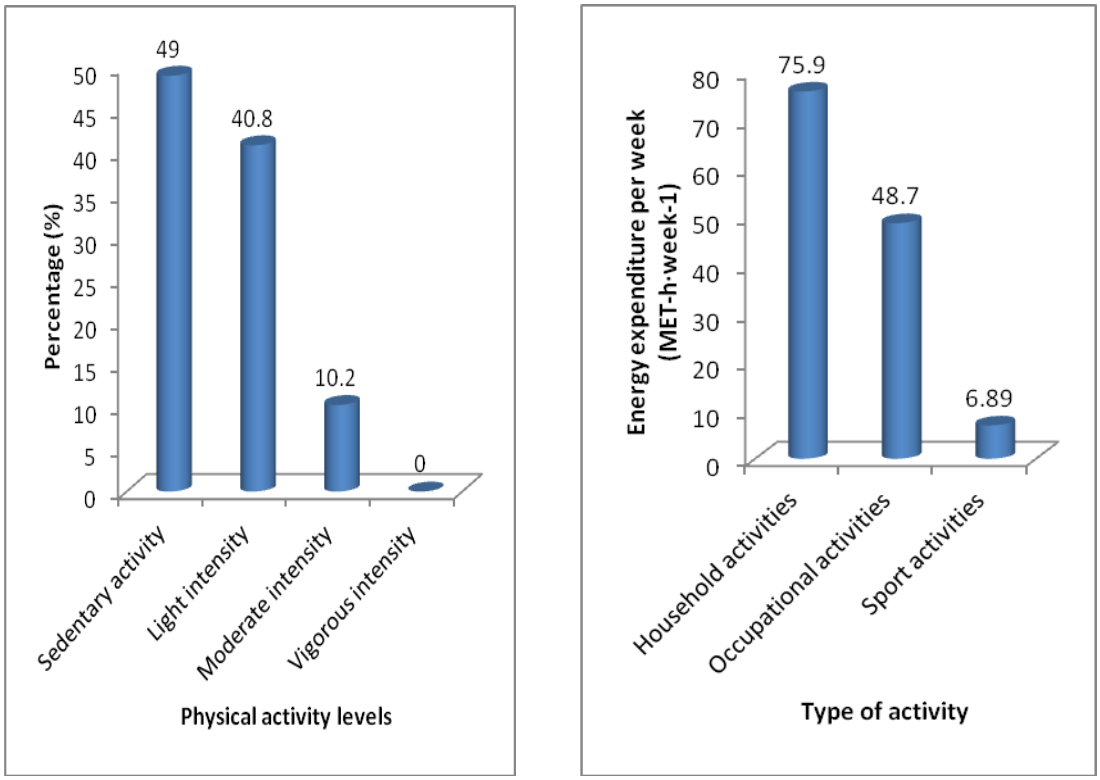
| Variable | Mean ± SD |
|---|---|
| **Age (years)** | 30.89 ± 4.44 |
| **Stage of Pregnancy** | **n (%)** |
| First Trimester | 102 (22.5) |
| Second Trimester | 125 (27.6) |
| Third Trimester | 226 (49.9) |
| **Gravid Level** | |
| Primi-gravid | 186 (41.1) |
| Gravida 2 | 107 (23.6) |
| Gravida 3 | 90 (19.9) |
| Gravida 4 | 38 (8.4) |
| Gravida 5 and above | 32 (7.1) |
| **Employment Status** | |
| Unemployed | 16 (3.6) |
| Paid worker | 194 (42.8) |
| Self employed | 194 (42.8) |
| Student | 49 (10.8) |
| **Educational Level** | |
| No formal education | 16 (3.5) |
| Primary education | 46 (10.2) |
| Secondary education | 122 (26.9) |
| Tertiary education | 269 (59.4) |
| **Total monthly income [Nigerian Naira (N), N160 = $1.00, mean = N72,520.61]** | |
| No monthly income | 59 (13) |
| Less than 50,000 | 274 (60.5) |
| 50,000 – 99,000 | 85 (18.8) |
| 100,000 – 149,000 | 30 (6.6) |
| 150,000 and above | 5 (1.1) |
| **Number of children** | |
| 0 | 199 (43.9) |
| 1 | 122 (26.9) |
| 2 | 88 (19.4) |
| 3 | 31 (6.8) |
| ≥ 4 | 13 (2.8) |

**Table 2:** Association between physical activity and clinical and socio-demographic variables

| **Variable** | | | | | |
|---|---|---|---|---|---|
| | | | | **$r_s$** | **p value** |
| Physical activity level and age | | | | -0.12 | 0.27 |
| Physical activity level and number of children | | | | 0.51 | 0.0001 |
| | **Physical activity level** | | | | |
| | **Sedentary** n. (%) | **Light** n. (%) | **Moderate** n. (%) | **$\chi^2$** | **p value** |
| **Stage of pregnancy** | | | | | |
| First trimester | 73 (71.6) | 24 (23.5) | 5 (4.9) | 28.97 | 0.001 |
| Second trimester | 59 (47.2) | 54 (43.2) | 12 (9.6) | | |
| Third trimester | 90 (39.8) | 107 (47.3) | 29 (12.8) | | |
| **Gravid level** | | | | | |
| Primigravid | 116 (62.4) | 61 (32.8) | 9 (4.8) | 32.48 | 0.0001 |
| Gravida 2 | 47 (43.9) | 50 (46.7) | 10 (9.3) | | |
| Gravida 3 | 36 (40.0) | 38 (42.2) | 16 (17.8) | | |
| Gravida 4 | 10 (26.3) | 22 (57.9) | 6 (15.8) | | |
| Gravida 5 and above | 13 (40.6) | 14 (43.8) | 5 (15.6) | | |
| **Employment status** | | | | | |
| Unemployed | 5 (31.3) | 8 (50.0) | | 21.54 | 0.006 |
| Paid worker | 106 (54.6) | 71 (36.6) | 17 (8.8) | | |
| Self employed | 82 (42.3) | 91 (46.9) | 21 (10.8) | | |
| Student | 29 (59.2) | 15 (30.6) | 5 (10.2) | | |
| **Educational level** | | | | | |
| No formal education | 8 (50.0) | 7 (43.8) | 1(6.3) | 6.04 | 0.42 |
| Primary | 16 (34.8) | 23 (50.0) | 7 (15.2) | | |
| Secondary | 61 (50.0) | 46 (37.7) | 15 (12.3) | | |
| Tertiary | 137(50.9) | 109 (40.5) | 23 (8.6) | | |
| **Monthly income [Nigerian Naira (N) N160 = $1.00]** | | | | | |
| No monthly income | 29 (49.2) | 21 (35.6) | 9 (15.3) | 7.824 | 0.451 |
| Less than 50,000 | 125 (45.6) | 122 (44.5) | 27(9.9) | | |
| 50,000 – 99,000 | 46 (54.1) | 32 (37.6) | 7 (8.2) | | |
| 100,000 – 149,000 | 19 (63.3) | 8 (26.7) | 3 (10.0) | | |
| 150,000 and above | 3 (60.0) | 2 (40.0) | 0 (0.0) | | |

### *Physical activity characteristics of the participants*

About half (222, 49.0%) of the participants were classified as sedentary based on their performance on the PPAQ, while 46 (10.2%) presented with a moderate level of physical activity (Figure 1A) and the remaining 40.8% presented with light physical activity level. None of the women could be classified as having a vigorous physical activity level. The results demonstrated that the women expended energy in all the physical activity domains including household, occupational and sports activities (Figure 1B). It was however observed that the highest amount of energy (75.9 MET-h.week-1) was expended on household activities.




A B

**Figure 1:** A - Physical activity levels of the pregnant women; B – Energy expenditure by type of activity

***Physical activity of the pregnant women by clinical and socio-demographic characteristics***

Association between physical activity level and the clinical and socio-demographic characteristics of the participants are presented in tables 2. Number of children ($r_s$ = 0.51, p = 0.0001), stage of pregnancy ($\chi^2$ = 28.77, p = 0.001), gravid level ($\chi^2$ = 32.48, p = 0.0001) and employment status ($\chi^2$ = 21.54, p = 0.006) were found to be associated with physical activity levels of the participants. Age, educational attainment and monthly income were however not associated with the physical activity level of the pregnant women (p > 0.05 in all). A multiple regression analysis was conducted to characterize how the selected clinical and socio-demographic characteristics predicted whether a pregnant woman will be sedentary or moderately physically active (Table 3). Although age did not significantly predict being sedentary, it was observed that the odds of being sedentary increased with increasing age. It was observed that the probability of being moderately active more than doubled (OR = 2.2, 95% CI = 1.85–2.82) in women who had at least four children while there was a significant and progressive increase in the risk of being sedentary across the three trimesters. Women in the third trimester had more than three times the risk of being sedentary (OR = 3.26, 95% CI = 2.11-4.56) compared to those in their first trimester. The risk of being sedentary was also found to increase in gravida 2 women (OR = 1.6, 95% CI = 1.37-1.85) compared to the primi-gravid women, only to reduce progressively from gravida 3 to gravida 5 and above women, where the risk of being sedentary was seen to have reduced by 58% (OR = 0.42, 95% CI = 0.22-0.76) compared to the primi-gravid women. Pregnant women with higher educational attainment had higher odds of being moderately active but this did not demonstrate statistical significance across the educational levels.

**Table 3:** Clinical and socio-demographic predictors of sedentary and moderate physical activity levels

| Variable | Sedentary level of physical activity n = 222 OR (95% CI) | Moderate level of physical activity n = 46 OR (95% CI) |
|---|---|---|
| **Age (years)** | | |
| < 20 | 1 | 1 |
| 20-29 | 1.21 (0.78-1.92) | 0.82 (0.71-1.34) |
| ≥ 30 | 1.46 (0.82-2.11) | 0.76 (0.66-1.28) |
| **Number of children** | | |
| 0 | 1 | 1 |
| 1-3 | 0.89 (0.61-1.34) | 1.6 (1.30-2.20)* |
| ≥ 4 | 0.63 (0.54-0.84)* | 2.2 (1.85-2.82)* |
| **Stage of pregnancy** | | |
| First trimester | 1 | 1 |
| Second trimester | 1.68 (1.23-2.75)* | 0.72 (0.61-0.84)* |
| Third trimester | 3.26 (2.11-4.56)* | 0.51 (0.33-0.79)* |
| **Gravid level** | | |
| Primi gravid | 1 | 1 |
| Gravida 2 | 1.6 (1.37-1.85)* | 0.84 (0.71-1.59) |
| Gravida 3 | 0.65 (0.43-0.77)* | 1.2 (0.56-1.53) |
| Gravida 4 | 0.59 (0.36-0.80)* | 1.61 (0.98-2.14) |
| ≥ Gravida 5 | 0.42 (0.22-0.76)* | 2.75 (1.82-3.13)* |
| **Employment status** | | |
| Unemployed | 1 | 1 |
| Paid worker | 3.24 (2.15-4.0)* | 0.78 (0.51-0.86)* |
| Self employed | 0.94 (0.77-1.26) | 1.44 (1.20-1.61)* |
| Student | 0.48 (0.36-0.57)* | 1.93 (1.74-2.83)* |
| **Educational status** | | |
| No formal education | 1 | 1 |
| Primary education | 0.58 (0.36-1.26) | 1.32 (0.85-1.65) |
| Secondary education | 0.74 (0.57-1.46) | 1.38 (0.76-1.72) |
| Tertiary education | 1.66 (0.91-2.02) | 0.71 (0.58-1.46) |
| **Monthly income [Nigerian Naira (N), N160 = $1.00]** | | |
| No monthly income | 1 | 1 |
| < 50,000 | 1.15 (0.83-1.27) | 0.74 (0.58-1.47) |
| 50,000-99,000 | 1.17 (0.94-1.75) | 0.62 (0.46-1.59) |
| 100,000-149,000 | 1.21 (0.54-2.16) | 0.82 (0.64-1.38) |
| ≥ 150,000 | 1.36 (0.89-2.01) | 0.59 (0.37-1.49) |

* = Significant at $p < 0.5$

# Discussion

This study examined the physical activity level of pregnant women attending three selected antenatal clinics in Ibadan, Nigeria. The major findings from this study are i) about half of the pregnant women were sedentary with only one out of ten being physically active at moderate level, ii) the highest amount of energy was expended doing household activities, iii) number of children, stage of pregnancy, gravidity and employment status had significant influence on the physical activity of the pregnant women, and iv) increasing number of children, increasing gravidity and being a pregnant student increased the probability of being physically active at moderate level while advancing stage of pregnancy significantly predicted increased risk of being sedentary.

The observation that most of the pregnant women seen in this study were sedentary implies that majority of the women did not have the habit of being physically active during pregnancy. As

this study did not include pregnant women that were excluded medically from undertaking physical activity, it then implies that other reasons apart from medical reasons may likely be responsible for their physical inactivity. Within the limits of this study, the reasons for their physical inactivity may be linked with a number of clinical and socio-demographic variables such as number of children, stage of pregnancy, gravidity and employment status, with each having a unique way of influencing the physical activity of the women. However, there may be other reasons outside the scope of this study that previous studies have examined. For instance, a study on knowledge, attitudes, and beliefs regarding exercise among pregnant Latinas by Chasan-Taber had alluded to issues surrounding safety and cultural norms of the pregnant women[7]. It may also be that the women did not receive adequate and in-depth education on the need for them to be physically active during pregnancy. For instance, in the study by Chasan-Taber, only 63% of the women reported that they received some form of information on physical activity during pregnancy[7]. Previous studies suggest that nutrition and exercise information offered through a lifestyle intervention during pregnancy may increase the practice of healthy behaviours[1]. Besides these, another possible reason for the inactivity may include a lack of awareness of the health benefits of exercise in pregnancy. A previous study reported that women believed diabetes was primarily related to heredity and diet but not to physical activity during pregnancy or in the postpartum period[5]. Low physical activity similar to that observed in this study was earlier reported by McParlin et al[2]. However, unlike the results from the present study where only 10% achieved moderate physical activity level, 46% of the pregnant women in the study by McParlin et al achieved the recommended 30 minutes of moderate or vigorous physical activity per day[2]. The wide disparity in the adoption of moderate physical activity between these two studies may be due to a number of reasons. The participants in the study by McParlin et al may have had a higher level of awareness, better motivation and fewer perceived barriers to physical activity compared to the participants in the present study[2].

This study also demonstrated that most of the energy expended by the pregnant women was on household activities. One possible reason for this observation could be that about half of the participants in the study were in their third trimester as at the data collection period. The third trimester is a period when the pregnant women, either self employed or in paid employment, usually embark on maternity leave which may make them spend more time at home than at work. Another possible reason is that most of the pregnant women may feel more comfortable and safer doing household activities than engaging in occupational or sports activities. These may be some of the reasons why the data from this study has shown that most of the women expended most of their energy on domestic activities. This result may be similar to what was described in a previous study, where it was reported that pregnant women spent significantly more time lying down, more time sitting, less time standing, less time milling about, and less time walking at a moderate-to-fast pace[15]. The dominant expenditure of energy in household activities in itself may not be the problem but the fact that the household activities may not amount to the energy expenditure required for health gains. The increased risk of being sedentary associated with more advanced stage of pregnancy may also be related with the fact that most women are typically more careful during the advanced stage of pregnancy, a situation that may be linked with a general fear of "perinatal or maternal accidents". The third trimester is also a period when there is a general distortion of the body frame with a backward sway leading to awkward positioning which makes household, sport or occupational activities more cumbersome. In a study by Guelinckx et al physical activity was reported to have decreased among pregnant women especially in the third trimester[12]. A recent study also documented that daily physical activity declined significantly with gestation from a median of 37 minutes at baseline to 23 minutes at the 35$^{th}$ week of pregnancy[16]. It was observed from this study that the physical activity of the pregnant women was significantly influenced by a number of clinical and socio-demographic variables. This included number of children, stage of pregnancy, gravidity and

employment status. It was also observed that increasing number of children, increasing gravid levels and being a pregnant student increased the probability of being physically active at moderate level, while a higher stage of pregnancy significantly predicted increased risk of being sedentary. The link between increasing number of children and the possibility of higher physical activity could be because pregnant women with more children are likely to be more active than those with fewer or no children. This is based on the higher level of activity required for mothering higher numbers of children. In a previous study, it was observed that there were no differences in any of the physical activity variables between overweight and obese pregnant women but multiparous women recorded more time in light physical activity than nulliparous women, while nulliparous women recorded more sedentary time[2]. In a slightly different observation, Hayes et al reported that younger age, nulliparity and higher socio-economic position were associated with higher physical activity at baseline and baseline activity (reflecting pre-pregnancy activity) was the strongest predictor of remaining active during pregnancy[16]. In the present study however, it was observed that women who had lower socio-economic indices presented with more physical activity although not statistically significant. This may be because women with lower socio-economic indices in the Nigerian environment are less likely to outsource housework and other services. This could have raised the physical activity level of the women with lower socio-economic indices compared to those with higher education, in paid employment and with higher income.

This study has documented the level of physical inactivity in a cross-section of pregnant Nigerian women. In spite of the body of evidence supporting the beneficial effects of exercise in pregnancy, there was a gap between the recommended levels of physical activity and the actual practice. This study also shows the stage of pregnancy and the group of pregnant women who are more likely to have lower levels of physical activity. The study has revealed the need for more research into cultural attitudes towards exercise in pregnancy and on effective ways of getting pregnant women in the Nigerian and similar environments to be physically active at recommended levels.

This study had some limitations and these limitations should be considered in interpreting the results. The study recruited all the pregnant women who gave consent to participate within a 12 week data collection period and the eventual sample turned out to have more of the women in their third trimesters than the other two semesters. In addition, there was no follow up on the participants hence it was not possible to note if there had been any physical activity transition among the women. Specifically, it is not known whether their physical activity increased or decreased as pregnancy progressed. Another approach may have been to administer the survey twice in the course of the pregnancy. Some psychosocial and cultural issues such as motivation, perceived barriers or even social support, which this study did not explore may also be responsible for the low levels of physical activity. It is also important to point out that the physical activity reported in this study is self-reported and it may have some potential recall bias. In addition, it should be noted that the women may have been involved in other peculiar activities such as yam pounding and firewood slashing among others, which may not have been captured by the questionnaire. Efforts were however made to adapt the questionnaire to fit into the activity peculiarities of this region within a limit that ensures the questionnaire was not completely overhauled.

## Conclusions

This study demonstrated that most of the pregnant women were not physically active at recommended levels and most of their energy was expended on household activities. A combination of clinical and sociodemographic characteristics was responsible for the physical activity level of the women. Efforts to inculcate health-enhancing physical activity into the routine household and occupational activities of pregnant women in this environment are desirable; and special attention needs to be paid to the group of pregnant women that have been identified as having higher risks of

physical inactivity whenever physical activity is being prescribed.

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### *Conflict of interest*

The authors declare no conflict of interests

## Contribution of Authors

AFA: Was involved in the conception, design and acquisition of data, analysis and interpretation of data. AFA was also involved in literature search and the drafting of the article.

OOO: Was involved in the, design and acquisition of data, analysis, interpretation of data and drafting of the article.

CIO: Was involved in the, design and acquisition of data, analysis and interpretation of data.

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