Article

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Relationship between physical activity level and flexibility profile of Nigerian postpartum women

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ABSTRACT

Flexibility is an essential component of musculoskeletal health and is usually associated with physical activity levels. Pregnancy and its aftermath may influence physical activity participation and musculoskeletal flexibility in women, which warrants this study. Thus, this study aimed to assess the physical activity level and musculoskeletal flexibility profile of Nigerian Postpartum women. In this cross-sectional study, 462 postpartum women were conveniently sampled from Healthcare Facilities in Anambra State, Nigeria. Physical Activity was assessed using Global Physical Activity Questionnaire while flexibility profile was assessed using modified sit-and-reach (for the lower back and limb components), total body rotation (for trunk component) and shoulder rotation tests (for upper limb components). Relevant inferential statistics were used to compare variables between the two groups of women. The results showed that 42.0% of the women were fairly flexible and 51.1% of them had high Physical Activity level. Majority (77.6%) of their daily physical activities were from work. Statistically, there was no significant relationship between their physical activity levels and flexibility profile of the participants ($p = 0.066$). The postpartum physical activity level of the respondents is not a determinant of their musculoskeletal flexibility. Recommendation of structured physical exercises, particularly flexibility trainings to postpartum women in Nigeria is necessary for optimum maintenance of their general postpartum and musculoskeletal health.

1. Introduction

During the postpartum recovery period, most women experience fatigue, depression, mood changes, low self-esteem, urinary incontinence, musculoskeletal problems, and body weight retention, etc. which can be physically and mentally demanding. The ability to function optimally during this period in order to regain and maintain health is important for both maternal and newborn wellbeing [1]. Engaging in and maintaining physical activity is one strategy that may help women to optimize their postpartum health and functional

status [1]. Physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure [2]. Regular physical activity is vital for improving overall health and fitness, maintaining a healthy weight, reducing risk for many chronic diseases and promoting good mental health. Researchers have also demonstrated that pregnant and postpartum women who exercise at a mild to moderate intensity at least three times per week experience increased cardiovascular fitness, improved well-being, reduced constipation, fewer leg cramps and a quicker return to pre-pregnancy weight compared with their non-exercising counterparts [3- 6]. However, many women do not engage in these recommended daily or health-enhancing levels of physical activity, during pregnancy and afterwards. Postnatal women are at high risk for physical inactivity and generally show lower levels of leisure-time physical activity compared to their pre-pregnancy levels [7].

Another benefit of postpartum physical exercises that is seemingly uncommon is regaining of normal flexibility and joint ranges of motion in order to minimize stress on the joints. Flexibility is the ability of the tissues surrounding a joint to yield to stretching without interference or opposition and then to relax [8]. The tissues to be stretched include ligaments, fasciae, other connective tissues related to the joints and, in many instances the antagonistic muscles as well. When joints are not regularly moved through their normal range of motion, muscles and ligaments shorten in time and flexibility decreases [9]. Adequate flexibility is desirable for all individuals and is considered to possibly prevent low back pain and some of the aches and pains that accompany ageing [8]. It also makes activities of daily living easier to perform. However, too much flexibility (hyper-flexibility) leads to unstable and loose joints, which may increase injury rate, including joint dislocation and subluxation [9]. Some sports activities and pregnancy are often associated with hyper-flexibility of some joints.

During pregnancy, the pelvic and spinal joints as well as their ligaments are relaxed and capable of greater range of motion [10]. The hormone responsible for this change in range of motion is relaxin [11]. Relaxation of ligaments, particularly the pelvic ligaments is probably played mainly by oestrogen [12]. After delivery, there is a rapid fall of oestrogen concentration over the first 48 hours [13]. Relaxin production also decreases and the ligaments tighten up after pregnancy [11]. This hormonal interplay most likely are supposed to return ranges of motion back to normal but most women still complain of pains and aches, especially back pain long after childbirth. Range of motion deficiencies in the spine and its supporting structures are viewed as prognostic indicators of low back pain [14]. Thus, flexibility may be compromised in most women after childbirth, owing from the nature of their complaints. Furthermore, non-compliance to postpartum exercises, as has been previously reported [7], [15] may also be a contributing factor to some of these postpartum musculoskeletal complications. This study therefore aimed at assessing the physical activity level and flexibility profile of post-partum mothers. Ascertaining these profiles will be useful in restructuring health education contents and exercise prescriptions of postpartum women for the purpose of improving their musculoskeletal health. Flexibility is joint and activity specific [8], inferring that optimum flexibility in one joint does not necessarily indicate flexibility in others [9]. Thus, musculoskeletal flexibility in this study will be assessed from different body components/regions (lower back and limbs, trunk and upper limbs).

1.1 Study design and participants

This descriptive cross-sectional research was administered on 462 postpartum women who were eligible and willing to participate and had been recruited using the convenience-sampling approach from healthcare facilities in Anambra State, Nigeria. The postpartum women included in this study were selected based on the following criteria: (i) age range of 19-35 years (ii) between six weeks and 36 weeks postpartum duration (iii) literate enough to read and/or understand the English and Igbo versions of the Global Physical Activity

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Questionnaire used in this study. Women with maternal or fetal complications during pregnancy labour and/or during the postpartum period, which restricted active participation in physical activities, as well as those with unhealed tears/episiotomy/caesarean incisions were excluded from this study.

Ethical approval was sought and obtained from the Health Research and Ethics Committee of the University of Nigeria Teaching Hospital, Ituku-Ozalla, Enugu state, Nigeria. Informed consent was sought and obtained from participants before commencing data collection.

1.2 Study Variables and Instrument

The major variables are the musculoskeletal flexibility profile and physical activity level of the participants which were assessed with the following instruments:

1. Locally constructed shoulder rotation tester, used for measuring the flexibility of the upper limb segments.
2. Locally constructed total body rotation flexibility tester for trunk flexibility assessment.
3. Locally constructed sit and reach flexibility tester for assessing the flexibility of the lower back and limbs.

These instruments have been validated and proven reliable for the assessment of musculoskeletal flexibility by several researchers [9], [16], [17].

Global Physical Activity Questionnaire (GPAQ Version 2). This WHO-recommended 16-item valid and reliable cross-cultural questionnaire [18- 20] collects information on physical activity participation in three settings (or domains) and sedentary behavior. These domains include activity at work; travel to and from places and recreational activities [21]. Both English and Igbo versions of the questionnaire were utilized in this study. The Igbo version was face and content validated by four experts with the test-retest reliability (10 days) coefficient, ranging from 0.78 to 0.89.

1.3 Study procedure

Subsequent to participant recruitment, relevant biodata and maternal information were collected from them. Each participant's height (metres) and body weight (kg) were measured with their body mass index (kg/m2) calculated afterwards. The questionnaire was administered to the women on face-to-face basis to encourage questions and clarifications between the respondents and the researcher.

Each participant underwent three flexibility tests which were conducted in March 2021, between 9:00am and 12noon each day in accordance with the guidelines of [9]. Prior to the tests, participants performed mild warm up exercises (marching on the spot with arm swings).

1. Modified sit and reach test

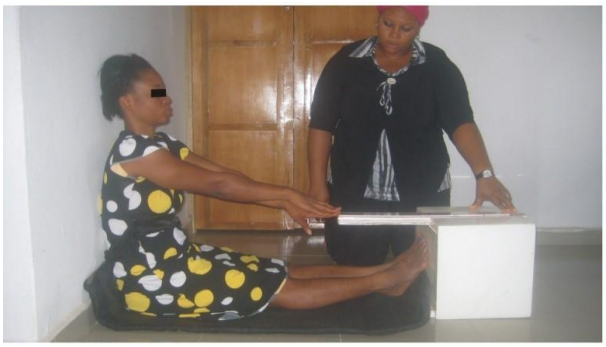
a. On barefoot, the participant was asked to sit on a mat with hips, back and head against a wall, legs fully extended and the feet against the sit-and-reach box.

b. Placing the one hand on top of the other, she was instructed to reach forward as far as possible without letting the head and back come off the wall (the shoulder may be rounded as much as possible but neither the head nor the back should come off the wall at this time). The researcher then slided the yard stick along the top of the box until the end of the indicator touched the participant's fingers. The yardstick was then held firmly in place throughout the rest of the test.

d. At this point, the participant's head and back came off the wall. Gradually, she tried to reach forward three times, the third time stretching forward as far as possible on the yardstick and holding the final position for at least 2seconds.

e. The final number of inches reached was recorded to the nearest 0.5inches.

The whole procedure was repeated again and an average of the two scores was used as the final test score. It was ensured that during the test, the back of the knees were kept flat against the mat.



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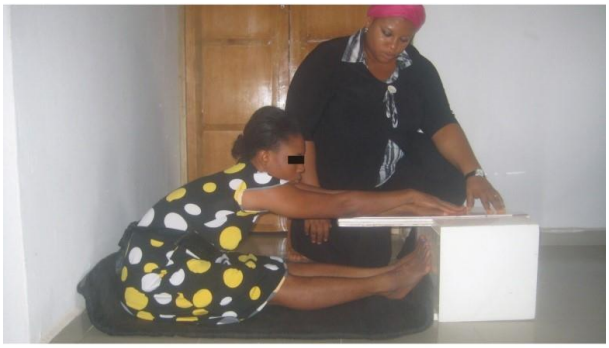

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Figure 1: Modified sit and reach test

2. Total body rotation test:
a. The body rotation tester was placed on the wall and adjusted to correspond with the participant's shoulder height.
b. The sliding panel between the two tapes was centered at the 15" mark. A corresponding line was drawn on the floor and centered with the 15" mark.
c. Standing sideways with the left de towards the wall and arm's length away from the wall, the feet were aligned straight ahead, slightly separated and the toes touching the center line drawn on the floor. The right arm (participants were all right-handed) was horizontally held out from the body, making a fist with the hand.
d. Participant was then instructed to rotate the trunk, the extended arm going backward (always maintaining a horizontal plane) and made contact with the panel, gradually sliding it forward as far as possible. The final position was held for at least 2seconds. The hand was positioned with the little finger side pointing forward during the entire sliding movement.

During the test, the knees were allowed to bend slightly but the feet were not moved nor rotated; they pointed forward and the body was kept as straight as possible. Two consecutive trials were performed and the farthest point reached was recorded, measurement taken to the nearest ½ inch and held for at least 2 seconds. The average of the two trials was used as the final test score. Proper hand position was ensured to avoid pushing the panel with extended fingers or knuckles.

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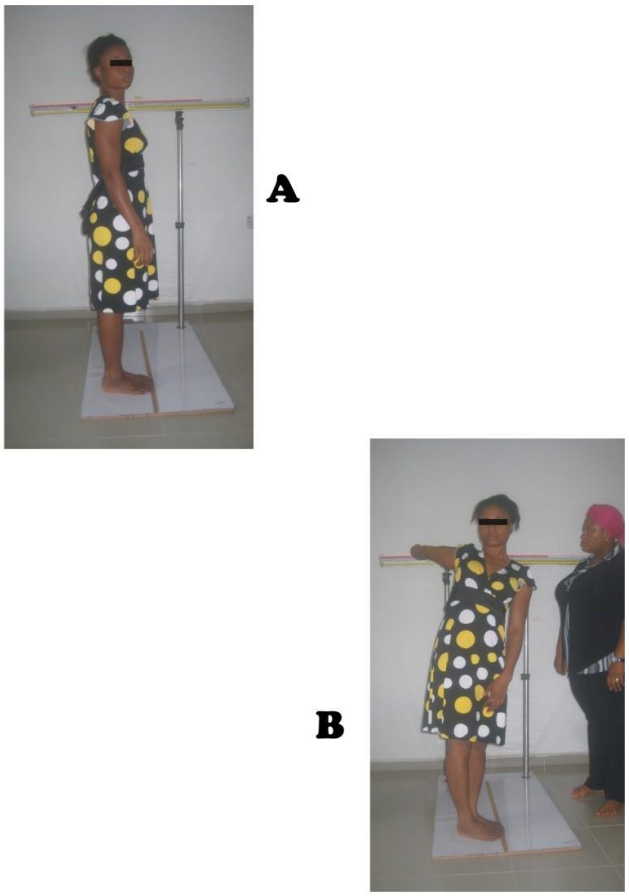

Figure 2: Total body rotation test

3. Shoulder rotation flexibility test:

a. Using the shoulder caliper, the biacromial width was measured to the nearest ¼ inches. The biacromial width was measured between the lateral edges of the acromion processes of the shoulders.

b. The flexibility tester was placed behind the participant's back and she was asked to hold onto the device using a reverse grip (thumbs out). The index finger of the right hand was placed next to the zero point on the scale and held firmly in place throughout the test. The left hand on the other end of the device was placed wherever comfortable.

c. Standing straight up and extending both arms to full length, with elbows locked, the measuring device was slowly brought over the head until it reached about forehead level. For subsequent trials, depending on the resistance encountered when rotating the shoulders, the participant was asked to move the left grip inward ½ inch to 1inch at a time and the task was repeated until the shoulders were able to rotate without undue strain or the elbows bending. The right hand grip was always kept against the zero point of the scale. The last successful trial to the nearest ½ inch was measured. This measurement was taken at the inner edge of the left hand on the side of the little finger.

d. The final score for this test was determined by subtracting the biacromial width from the best score (shortest distance) between both hands on the rotation test. For example, if the best score is 35" and the biacromial width is 15", the final score is 20" (35-15=20).

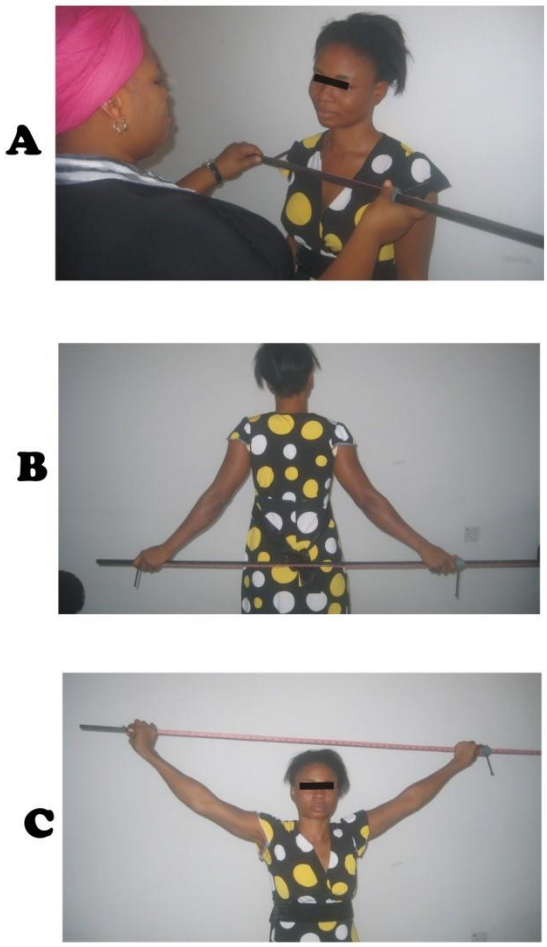

Figure 3: Shoulder rotation flexibility test

1.4 Data Analysis

Using the data processing guidelines [21], the information obtained from the GPAQ questionnaire allowed estimate of a total weekly physical activity score determined as a metabolic equivalent (MET), using the combination of each category to create a total score. The total GPAQ score classifies each participant to belong to either low, moderate or high physical activity level categories.

According to [9], the flexibility test scores were used to determine the respective fitness categories according to percentile ranks on table 1. Subsequently, the overall flexibility fitness category was then determined from table 2.

The entire data from this study were analyzed using the Statistical Package of Social Sciences (SPSS, version 21). Frequencies, percentages and cross-tabulations were used for descriptive data analysis. Statistical tests were performed using Pearson's correlation scale to analyze the relationship between physical activity level and flexibility profile.

Table 1: Percentile ranks for the modified sit-and-reach, total body rotation and shoulder rotation tests

Percentile rank	**Sit-and-reach Inches (Centimetres)**	**Total body rotation Inches (Centimetres)**	**Shoulder rotation Inches (Centimetres)**
99	21.0 (53.3)	29.4 (74.7)	-2.4 (-6.1)

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95	19.3 (49.0)	25.3 (64.3)	6.2 (15.7)
90	17.9 (45.5)	23.0 (58.4)	9.7 (24.6)
80	16.7 (42.4)	20.8 (52.8)	14.5 (36.8)
70	16.2 (41.1)	19.3 (49.0)	17.2 (43.7)
60	15.8 (40.1)	18.0 (45.7)	18.7 (47.5)
50	14.8 (37.6)	17.3 (43.9)	20.0 (50.8)
40	14.5 (36.8)	16.0 (40.6)	21.4 (54.4)
30	13.7 (34.8)	15.2 (38.6)	24.0 (61.0)
20	12.6 (32.0)	14.0 (35.6)	25.9 (65.8)
10	10.1 (25.7)	11.1 (28.2)	29.1 (73.9)
05	8.1 (20.6)	8.8 (22.4)	31.3 (79.5)
01	2.6 (6.6)	3.2 (8.1)	37.1 (94.2)
Source: [9]			

Table 2: Flexibility Fitness Categories for Percentile Ranks

Percentile Rank	**Fitness Category**	**Points**
≥ 90	Excellent	5
70 – 90	Good	4
50 – 60	Average	3
30 – 40	Fair	2
≤ 20	Poor	1
Source: [9]		

2. FINDINGS

In all 462 postpartum women participated in this study. The mean age and BMI of the postpartum women are 27.30±4.4yrs and 25.68±4.3 kg/m2, respectively. Frequency distribution and relationship between participants' physical activity levels and flexibility profile are presented in table 3. Majority of the postpartum women had fair flexibility profile (42.0%) and high Physical Activity level (51.1%). In a descending order, participants' daily physical activities were from work (77.6%), travel (20.0%) and recreation (0.18%). Majority of the participants with low and medium physical activity levels had fair flexibility profiles (for the 'low' category – 54.5% and 'medium' category – 42.4%). On the other hand, a majority of those with high physical activity level had average flexibility profiles (38.1%). Statistically, there was no significant relationship between their physical activity levels and flexibility profile of the participants (p = 0.066) (Table 3).

Table 3: Frequency distribution and relationship between participants' flexibility profile and physical activity level

Physical Activity Level	**Flexibility Profile**					
	Poor n (%)	**Fair n (%)**	**Average n (%)**	**Good n (%)**	**Excellent n (%)**	**Total n (%)**
Low	9 (8.9)	55 (54.5)	32 (31.7)	5 (5.0)	0 (0)	101 (21.9)
Medium	5 (4.0)	53 (42.4)	43 (34.4)	24 (19.2)	0 (0)	125 (27.1)
High	21 (8.9)	88 (37.3)	90 (38.1)	37 (15.7)	0 (0)	236 (51.1)
Total	35 (7.6)	196 (42.4)	165 (35.7)	66 (14.3)	0 (0)	462 (100)
Pearson's Correlation						
r- value	0.086					

p- value	0.066

3. DISCUSSION

This research assessed the physical activity level and musculoskeletal flexibility profile of Nigerian Postpartum women. This study found the postpartum women to have high physical activity levels although only a little percentage of their daily physical activities were from recreational activities which for the purpose of this study refers to sports, fitness and leisure time activities. This finding is contrary to previous research on this topic where decreases have been reported in the general physical activity practices of postpartum women [22], [23]. These activities are supposed to comprise of strength, aerobic and stretching exercises [24], [25]. Lack of time and issues with childcare are the most common barriers to physical activity among postpartum mothers [26]. Other barriers include work schedules, lack of social support, physiological changes, among others [5], [27].

Although majority of the participants with low and medium physical activity levels had fair flexibility profiles where as a majority of those with high physical activity level had average (better) flexibility profiles, no statistically significant correlation was found between the physical activity levels and flexibility profile of the postpartum women. This finding differed from the findings of previous studies who reported that women's physical activity level show statistically significant association to their flexibility profile [22], [23], [28- 30]. Beaulieu [31] stated that participation in regular exercise involving full range of motion generally enhances flexibility. With less physical activity, muscles lose their elasticity and tendons and ligaments tighten and shorten [9].

Meanwhile, the result showed that a large percentage of the postpartum women had fair flexibility profile. Declines in flexibility may cause poor posture, resulting in subsequent aches and pains [9]. Range of motion deficiencies in the spine and its supporting structures are viewed as prognostic indicators of low back pain [14] as most back problems have been reported to stem from improper alignment of the vertebral column and pelvic girdle, a direct result of inflexible and weak muscles [9]. Several postural changes also occur during pregnancy and may persist during the postpartum period. Activities involved in nurturing the new born such as breastfeeding and house chores are sometimes carried out in wrong postures thereby further predisposing postpartum women to aches as well as reduced flexibility considering that reduced trunk and hip flexibility have been observed among individuals with poor postural habits [32].

The recorded suboptimal flexibility profile of the postpartum women in this study could be attributed to the possibilities of poor posture which is inherent among postpartum mothers as seen in other studies [11], [12]. Findings herein may also be attributable to biomechanical changes occurring during pregnancy [33], [34] and lack of structured physical activity among the women [35]. Joint pain and injuries are common causes of reduced range of motion [8], [9] and this may be a contributing factor to joint range deficiencies after childbirth as most women still have persistent complaints of musculoskeletal problems during this period.

3.1 Constraint

It is worthy to note that the generalizability of these study findings might have been affected by the poor knowledge of the pre-pregnancy physical activity levels and flexibility profile of the subjects, which made it difficult to confidently conclude that some of the results gotten from this study were attributable to changes induced by pregnancy and childbirth. Also, the questionnaires used in this study involved re-call of the participant's daily and weekly physical activities. This made it difficult for some of the volunteers to participate in this study because of inability to recall the actual duration and patterns of their physical activities. Besides, there is possibly error due to re-call inadequacy.

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4. Conclusion

Postpartum women in Nigeria predominantly had fair musculoskeletal flexibility and high physical activity levels although most of their activities seemed unstructured being usually work-related physically activities. Moreover, the postpartum physical activity level of the respondents is not a determinant of their musculoskeletal flexibility. Recommendation of structured physical exercises, particularly flexibility trainings to postpartum women in Nigeria is necessary for optimum maintenance of their general postpartum and musculoskeletal health.

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