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Physical Activity Level and Adiposity: Are they Associated with Primary Dysmenorrhea in School Adolescents?

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Abstract

Information on self-reported physical activity (PA) level in association with primary dysmenorrhea (PD) is not readily available on African populations, and there is a dearth of information on the association of adiposity with PD. This study explored the association of PA and adiposity indices with PD and associated menstrual pain. This cross-sectional study involved 1383 female adolescents from 12 randomly selected secondary schools (9 private and 3 public schools). They were categorized into <1 hour/day or ≥ 1 hour/day of PA based on their reported average duration of PA per day. The adiposity [body mass index (BMI) and waist circumference (WC)] was assessed using standardized procedures. Majority of participants (85.4%) in this study sample reported experiencing PD. More participants without PD engaged in PA for more than one hour daily than those with PD (X^2=11.49; p=0.001). The participants with PD experienced menstrual pain mostly (55.1%) during menstruation and the mostly reported pain intensity was moderate (38.7%). Majority of those (80.5%) who had menstrual pain did not report using medication for the pain. 77.0% of those who used medication reported having pain relief. Waist circumference, BMI and PA level showed no independent association (p>0.05) with either PD or its pain intensity experienced among the adolescents. PA level and adiposity are not associated with PD in school adolescents. *(Afr J Reprod Health 2013; 17[4]: 167-174).*

Keywords: Adiposity, Primary Dysmenorrhea, Physical Activity, Adolescence

Résumé

Les informations sur le niveau d'activité physique auto-déclarée (AP) en association avec la dysménorrhée primaire (DP) par rapport aux populations africaines ne sont pas facilement disponibles et il y a un manque d'informations sur l'association de l'adiposité avec la DP. Cette étude a exploré l'association de l'AP et des indices d'adiposité avec la DP et les douleurs menstruelles associées. Cette étude transversale a impliqué 1 383 adolescentes de 12 écoles secondaires choisies au hasard (9 écoles publiques, et 3 écoles privées). Elles ont été classées en < 1 heure / jour ou ≥ 1 heure / jour de AP en fonction de leur durée moyenne déclarée de AP par jour. L'adiposité [indice de masse corporelle (IMC) et le tour de taille (TT)] ont été évalués à l'aide des procédures standardisées. La majorité des participants (85,4%) de l'échantillon de l'étude ont déclaré avoir subi la DP. Plus de participants sans DP étaient engagés dans la AD pendant plus d'une heure par jour que ceux DP (X2 = 11,49, p = 0,001). Les participants DP ont connu surtout les douleurs menstruelles (55,1%) pendant la menstruation et l'intensité de la douleur souvent rapporté a été modérée (38,7%) . La majorité d'entre elle (0,5%) qui ont eu la douleur menstruelle n'ont pas signalé l'utilisation de médicaments contre la douleur. 77,0% de ceux qui ont utilisé des médicaments ont déclaré avoir été soulagées. Le tour de taille, l'IMC et le niveau d'AP n'ont pas montré une association (p > 0,05) avec soit la DP soit son intensité de douleur ressentie chez les adolescents. Le niveau d'AP et de l'adiposité ne sont pas associés à la DP chez les adolescents qui fréquentent école. *(Afr J Reprod Health 2013; 17[4]: 167-174).*

Mots clés: adiposité, dysménorrhée primaire, activité physique, adolescence

Introduction

Dysmenorrhea is the most common gynecological disorder in menstruating women[1], and is classified as primary and secondary. Primary dysmenorrhea (PD) is the occurrence of painful menstrual cramps of uterine origin in the absence of any obvious underlying disease and is typically known as menstrual pain[2,3]. Secondary dysmenorrhea, on the other hand, is menstrual pain associated with some

underlying disease or structural abnormality either within or outside the uterus[4].

Primary dysmenorrhea usually begins within the first six-to-twelve months after menarche when a regular ovulatory cycle has been established[5]. There may be associated systemic symptoms like nausea, vomiting, diarrhea\constipation, headache, dizziness, lightheadedness, fatigue, and syncope[4,5]. In addition, urinary frequency, irritability, nervous depression, abdominal bloating may occur during the menstrual period[5]. The pain usually begins on or just before the menstrual bleeding and gradually diminishes over 1-to-3 days. Furthermore, the pain may be intermittent and may range from mild to severe[6]. The menstrual pain becomes less as a woman's age advances[7].

The prevalence of PD among menstruating women is as high as 80% to 90% with 15% to 33% reporting moderate to severe menstrual pain[8-10]. Primary dysmenorrhea is the leading cause of recurrent short-term school and work absenteeism in adolescent girls and women, and it has a negative impact on social, academic and sports activities in female adolescents[11]. In the study by Banikarim et al[11], Hispanic female adolescents reported that the activities affected by PD included concentration in class, class participation, socialization, home work, and test-taking skills, grades and sports participation.

Behavioural risk factors, such as smoking, alcohol consumption, poor dietary intake and low PA levels have been associated with having PD[9, 12]. On the contrary PA is reportedly not associated with pain[9]. Other risk factors for PD include null parity, heavy menstrual flow, lengthy periods, psychological symptoms, overweight, underweight, and commencement of menstruation before the age of 11[13-15]. Studies had explored the PD in relation to physical exercise[14,16-19]. These studies, however, involved samples from outside Africa. Research on PA level in relation to PD is important due to the psycho-social and academic implications of PD in adolescents. Further, there is a dearth of information on obesity indices in relation to PD. This study explored the associations of PA level and obesity indices with occurrence of PD, and with dysmenorrhoeic pain intensity in school adolescents.

Methods

Participants

This cross-sectional study involved 1383 female adolescents from 12 randomly selected secondary schools (9 private and 3 public schools) from a total of 37 secondary schools (31 private and 6 public) registered with the Local Education Authority in Nnewi. Each of these schools has three junior classes and three senior classes. From each of the six classes in the randomly selected schools, an arm was further randomly selected. The sample for this study was drawn from the selected arms. The participants were categorized into those with PD and those without PD. Those who had ever been pregnant, diagnosed with ovarian or uterine pathology or had experienced sexually-transmitted disease were excluded from this study[20]. Also, none of the participants was older than 19 years, was bleeding in-between menstrual periods, had irregular cycles[20], nor had a history of pelvic inflammatory disease[21]. They also had not used contraceptive pills or injection in at least the last three months, and did not have the first experience of PD latter than 10 months after menarche. They also did not have lower abdominal pain at any other times than just before or during menstruation[22,23].

Procedures

The Ethics Committee of the Nnamdi Azikiwe University Teaching Hospital, Nnewi, approved the procedures employed in this study. During the first visit to the selected schools, the principals of the schools were approached to explain the nature and purpose of the study and to seek their consent to collect information required in the study on their students. They all gave their consent and a date and time were given for the data collection. On the data collection day, the eligible students who had already been informed about the exercise, and had been required, by their respective class teachers, to inform their parents and guardians, and seek their consent were gathered at a section of the school premises and a screen in the form of a cubicle was provided for their privacy during the measurement. Before data collection, the students were once again

asked to ascertain the consent of their parents, and if obtained, the procedures of the research were, once again explained to them. To ensure that none of the female students in a selected class was inadvertently omitted, the class registers were obtained from the class teachers, and names were ticked off as the students were attended to. In addition, information was collected on their ages at the last birth day, characteristics of PD and its management using a questionnaire. The following measurement procedures as well as derivations were carried out.

Physical Activity Level

Physical activity level was assessed by asking the participants to indicate the average number of minutes or hours per day that they engaged in PA such as walking, running, cycling, gardening, traditional game pastimes, house work, sports etc. Based on their responses, they were divided into two PA categories: those who engaged in PA for less than 1 hour per day (<1 h/day) and those who engaged in physical activity for up to 1 hour per day (≥1 h/day).

Adiposity Indices

Heights of the participants were measured using a height meter (Seca, 220 Measuring Rod): participants stood bare-foot and erect, looking straight ahead, and the height was read off to the nearest 0.01 cm from the height meter at the level of vertex of the head. Body weight was measured using a weighing scale (Hana, model BR9011, 120x0.01kg, China): Before the participants got on the scale, the pointer was on the zero point; the participants were measured barefoot and with minimal clothing while standing on the weighing scale. The weight was read off the scale from the scale with the observer bending over the scale. Body Mass Index (BMI) was determined from measured height and weight of the participants using the relation: Weight/Height$^{2.}$ Waist circumference (WC) was measured at the level of the umbilicus using an inelastic tape measure (Butterfly, China) to the nearest 0.01cm.

Pain intensity experienced during menstruation was assessed by using Visual Analogue Scale (VAS) involving a 10 cm straight line with one end marked '0' indicating no pain and the other end marked '10' indicating extremely severe pain. Participants were asked to indicate a point on the straight line corresponding to the pain intensity he experienced during menstruation.

Five research assistants, who had been trained in field data collection, and measurements and recording procedure of the variables examined in this study carried out the measurement. Based on the measured WC participants were divided into 'non-overweight' and 'overweight/obesity' categories using 85 percentile cut-off points for age and gender while for BMI, they were divided into 'non-overweight' and 'overweight/obesity' categories using the cut-off points for age and gender base International Task Obesity Task Force (ITOF) criterion [25].

Statistical Analyses

The data were summarized using the descriptive statistics of mean and standard deviation as well as frequency and proportion. Multivariate logistic regression was used to determine the associations of PD and dysmenorrhiec pain intensity (dependent variables) with PA level and adiposity. The test of association between PD occurrence and each of PA level and adiposity, indices was adjusted for BMI, waist circumference, age and pain intensity level whereas the one between pain intensity and each of PA level and obesity indices were adjusted for BMI, waist circumference, age and use of pain medication. All analyzes were carried out using SPSS version 20 at α= 0.05.

Results

The mean age of participants with PD (16.02±1.32 years) was significantly higher than that of those without PD (15.71±1.35 years) (Table 1). Majority of participants (85.4%) in this sample reported experiencing PD. The mean values of other demographic characteristics are as shown in table 1. More participants without PD engaged in PA for more than one hour daily than those in those with PD (X^2=11.49; p=0.001). However, BMI and WC were not significantly different (p>0.05) between the two groups (Table 1).

Table 1: Demographic and Biological Characteristics of Participants

	With PD (n=1181)	**Without PD (n=202)**		
Characteristics	Mean±SD	Mean±SD	t-value	p-value
Age (yr)	16.02±1.32	15.71±1.35	3.06	0.002*
Height (m)	1.63±0.05	1.62±0.06	2.35	0.019*
Weight (kg)	57.67±8.63	55.841±8.30	2.80	0.005*
Body Mass Index (kg/m^2)	21.81±2.98	21.39±3.029	1.85	0.065
Waist Circumference (m)	71.06±6.25	70.72±6.09	0.73	0.468

The mean age at menarche among those with PD was 13.04±1.20 years and their mean age at the first experience of PD was 13.76±1.23 years.

Fewer participants with PD (61.3%) than those without PD (73.8%) engaged in PA for more than one hour daily (Table 2). However, more participants who reported experiencing severe pain than those who reported mild-moderate pain intensities engaged in PA for more than one hour per day (Table 3) Prevalence of PD tended to decrease with increasing BMI, whereas it tended to increase with increasing WC (Table 2). Also, prevalence of severe pain experience during PD tended to decrease with increasing BMI and WC (Table 3).

Table 2: Frequency Distribution of PA and Adiposity Levels, and Dysmenorrheic Characteristics of Participants

		With PD (n=1181) Frequency (%)	**Without PD (n=202) Frequency (%)**
PA:	< 1 hour/day	455 (38.7)	53 (26.2)
	≥ 1 hour/day	721 (61.3)	149 (73.8)
BMI (kg/m^2)	< 5 Percentile	42 (71.2)	17 (28.8)
	5- ≤85 Percentile	970 (86.0)	158 (14.0)
	>85 Percentile	169 (86.2)	27 (13.8)
WC	< 5 Percentile	73 (86.9)	27 (13.1)
	5- ≤85 Percentile	965 (85.4)	165 (14.6)
	>85 Percentile	143 (84.6)	26 (15.4)
Menstrual Pain	Just Before	410 (37.2)	-
	During	608 (55.1)	-
	The Whole Period	85 (7.7)	-
Medication Use	Yes	230 (19.5)	-
	No	951 (80.5)	-
Relief as a result of medication	Yes	171 (77.0)	-
	No	51 (23.0)	-

Table 3: Frequency Distribution of PA and Adiposity Levels, and Dysmenorrheic Pain Intensity of Participants

		Mild-Moderate (n=535) Frequency (%)	**Severe (n=848) Frequency (%)**
PA:	< 1 hour/day	318 (39.0)	142 (37.5)
	≥ 1 hour/day	497 (61.0)	237 (62.5)
BMI (kg/m^2)	< 5 Percentile	34 (77.3)	10 (22.7)
	5- ≤85 Percentile	678 (69.0)	305 (31.0)
	>85 Percentile	106 (61.6)	66 (38.4)
WC	< 5 Percentile	56 (75.7)	18 (21.4)
	5- ≤85 Percentile	674 (68.7)	307 (31.3)
	>85 Percentile	88 (61.1)	56 (38.9)

Menstrual pain was experienced among those with PD mostly (55.1%) during menstruation and majority of the participants (80.5%) who had menstrual pain did not use medication for the pain (Table 2). Out of those that use medication for their menstrual pain, 77.0% had pain relief (Table 2). The most frequently reported pain-relieving medication was paracetamol (82.8%), and the mostly reported menstrual pain intensity by those with PD was moderate (38.7%). The most frequently reported symptoms associated with PD were abdominal bloat (21.9%), breast tenderness (17.9%), fatigue (15.7%) and headache (15.7%) (Figure 3).

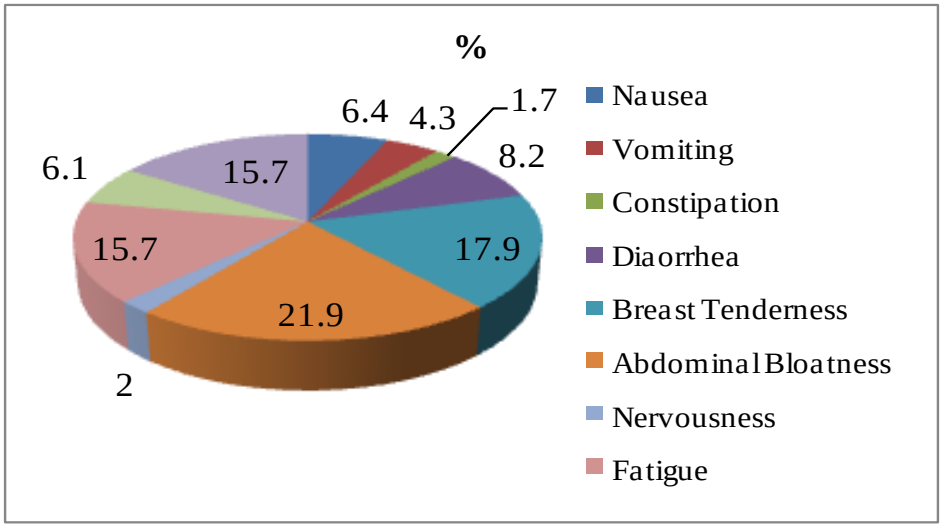

Figure 1: Distribution of Symptoms among Participants with PD

Waist circumference, BMI and PA level showed no association (p>0.05) with either PD or its pain intensity experienced among the adolescents (Table 4). Although BMI showed unadjusted association with PD, this association disappeared after adjusting out age, WC, experienced pain intensity and PA level (Table 4). Also, BMI and WC showed tendencies for decreased unadjusted prevalence odd ratio for having severe pain with increasing values or higher categories (Table 4).

Table 4: Prevalence Odd Ratios of having Primary Dysmenorrhea and Severe Pain Intensity from Physical Activity Level and Obesity Indices

		Odd Ratio (95% Confidence Interval); p-value	
		Unadjusted	**Adjusted**
Occurrence of PD			
PA:	< 1 hour/day	1.00	1.00
	≥ 1 hour/day	1.77 (1.27 to 2.48); 0.001	1.57 (0.92 to 2.69); 0.10
BMI (kg/m^2)	< 5 Percentile	1.00	1.00
	5- ≤85 Percentile	0.40 (0.22 to 0.72); 0.002	0.45 (0.14 to 1.51); 0.20
	>85 Percentile	0.40 (0.20 to 0.79); 0.009	0.48 (0.11 to 2.11); 0.33
WC	< 5 Percentile	1.00	1.00
	5- ≤85 Percentile	1.14 (0.59 to 2.19); 0.71	1.26 (0.41 to 3.90); 0.68
	>85 Percentile	1.21 (0.57 to 2.58); 0.63	1.05 (0.25 to 4.36); 0.94
Severe Pain Intensity			
PA:	< 1 hour/day	1.00	1.00
	≥ 1 hour/day	0.94 (0.73 to 1.20); 0.61	0.94 (0.72 to 1.21); 0.61
BMI (kg/m^2)	< 5 Percentile	1.00	1.00
	5- ≤85 Percentile	0.62 (0.29 to 1.30); 0.20	0.71 (0.33 to 1.53); 0.38
	>85 Percentile	0.46 (0.21 to 1.02); 0.06	0.65 (0.27 to 1.56); 0.33
WC	< 5 Percentile	1.00	1.00
	5- ≤85 Percentile	0.68 (0.39 to 1.19); 0.18	0.78 (0.44 to 1.39); 0.40
	>85 Percentile	0.49 (0.26 to 0.92); 0.03	0.75 (0.36 to 1.58); 0.45

Discussion

The objective of this study was to explore associations of the PA level and adiposity indices with PD in school adolescents. In this study, PA level and the examined adiposity indices showed no association with either PD or its pain intensity as experienced among the adolescents.

The finding of no association between PA level and PD occurrence in this study contrasts the

findings in some previous studies[14,26,27]. In a review of 63 articles on factors associated with PD, Latthe et al.[14] reported inverse association between exercise and PD occurrence. Also, Daley[26] and Brown and Brown[27], from clinical trials, albeit of limited methodological quality, suggested that exercise may reduce some symptoms during the menstrual phase. However, it corroborates the finding in another study[16]. The finding in this study implies that PA performance bears no association with having PD among the adolescents. Furthermore, it is important to mention that, despite the finding of no association between PA level and PD occurrence, higher PA level tended to be associated with PD occurrence. This tendency appears counter-intuitive, and we have no specific explanation for it. However, it might be that some of participants confused PD occurrence with PD pain as Locke and Warren[28] reported higher level of menstrual discomfort with exercise after adjusting out possible confounders. Apparently, previous studies only investigated PA in relation to symptoms of PD as against PD occurrence, and this limits comparison of this finding with those of previous studies.

The scientific reports concerning the effect of PA on dysmenorrheic pain intensity offer mixed evidence[29]. Similar to the finding in this study, some previous studies reported no associations between dysmenorrheic pain intensity and PA level[16,17,30]. Furthermore, this finding concurs with the finding on association between PA level and occurrence of PD in the current study. Some other authors, however, reported to the contrary[19, 31].

Further, a systematic review reported reduced score on Moo's Menstrual Distress Questionnaire, in the exercise group, during the menstrual phase and the observed cycle compared with the control[27]. However, after controlling for disposition and mood, exercise is actually associated with higher level of menstrual discomfort[28].

The proponents and advocates of physical exercise in the management of PD seem to have based their recommendation on anecdotal accounts. For instance, the American College of Obstetrics and Gynecology has advised that regular aerobic exercise may help relieve premenstrual syndrome[32] despite the inconclusive evidence from the literature. However, explanations have been given for possible favorable effects of physical exercise on PD. Primary dysmenorrhea has been associated with stress[33], and physical exercise has been used to reduce the perception of stress or inducing biochemical changes in the immune system[34]. Thus reduction of stress, through the exercise, is perceived to also have reducing effect on PD. Another proposed mechanism is improved metabolism through increase in blood flow at the pelvic level[31]. The discordant reports in the literature may be linked to varying definitions of PD and PA, varying study design and different modes of data collection[29].

The outcome of a Cochrane review on the benefit of exercise in the management of PD shows that although the available evidence implies that there are no adverse effects associated with exercise, the outcome is limited by the methodology of the reviewed studies to be considered as supporting the use of exercise in alleviating symptoms associated with PD[27]. Thus, high-quality randomized controlled trials with adequate sample size are needed to arrive at any definitive recommendation of exercise as a beneficial treatment strategy for PD. At any rate, it is important to let the individuals living with PD know broader health benefits of exercise beyond PD[27].

In contrast to the finding in this study, the Child Development Institute[15], reported overweight as a risk factor for occurrence of PD, and Latthe et al.[14] reported an association between low BMI and occurrence of PD in a systematic review. However, the finding of no association between WC and dymenorrheic pain intensity in this study is in agreement to the findings in a previous study[35]. The findings in this study suggest adiposity indices are not associated with PD occurrence and its pain intensity among the school adolescents.

The findings in this study have public health implication, specifically, in adolescents, in the sense that they indicates that PA level and adiposity are not associated with PD occurrence or the intensity of its attendant pain. This, however, does not rule out the overall health benefits of PA even in those with PD. However, the subjective

nature of the PA level assessment employed in this study and the possibility of recall bias on the part of the adolescent may limit the findings in this study. The use of this assessment strategy was based on the consideration that a more complex assessment tool might not be appropriate for the age group of the participants. Further, retrospective reporting of menstrual pain may be inaccurate[36]. In addition, this is a cross-sectional study from which cause and effect conclusion cannot be drawn. Despite these limitations, this study has strength in its sample size and random sampling of the participants. We recommend that more studies of this nature, employing objective assessment of PA, be carried out to establish the validity of the findings in this study. In conclusion, PA level and adiposity are neither associated with PD occurrence nor the intensity of its attendant pain.

Contribution of Authors

Conception and design of the study; analyses of data; preparation of manuscript: Fatai A. Maruf
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Revision of manuscript for adequate intellectual content: Ade F. Adeniyi

Preparation of manuscript: Emmanuel C. Okoye
All these authors approved the manuscript.

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