



ASSOCIATION BETWEEN SOCIO-ENVIRONMENTAL FACTORS AND THE PRACTICE OF PHYSICAL ACTIVITY IN PREGNANT WOMEN: A CROSS-SECTIONAL STUDY

Asociación entre factores socioambientales y la práctica de actividad física en mujeres embarazadas: estudio de corte transversal

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ABSTRACT

Objective: To establish the relationship between social and environmental determinants and the practice of physical activity in pregnant women.

Materials and methods: Cross-section study conducted in pregnant women with no contraindication to physical activity; these women came for prenatal consultation and were affiliated to two healthcare providers in Barranquilla and Cartagena de Indias, Colombia. Sampling was intentional. The social and demographic characteristics were evaluated, as well as the levels of physical activity and the perception of socio-environmental factors, including neighborhood infrastructure, esthetic

considerations, the social environment, road connectivity, safety and surrounding traffic conditions. The raw Odds Ratio (OR) was estimated.

Results: Out of 228 pregnant women, 208 were included in the analysis. 62% of the pregnant women fail to comply with the physical activity recommendations for maintaining their health. Some of the socio-environmental factors associated with a sedentary lifestyle in pregnancy are: living far away to walk to shops and supermarkets (OR = 5.1; 95 % CI: 2.8-9.4); poor sidewalk conditions (OR = 3.4; 95 % CI: 1.9-6.3); few people exercising around the neighborhood (OR = 4.1; 95 % CI: 2.2-7.5); not safe to walk during the day or evening (OR = 3.6; 95 % CI: 1.9-6.4).

Conclusion: The perception of the socio-environmental characteristics is associated with physical activity in pregnant women. Interventions are needed to improve the socio-environmental characteristics that impact the perception of the population about these factors, in order to assess its impact on the physical activity of pregnant women..

Key words: Motor activity, environment, pregnancy.

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RESUMEN

Objetivo: establecer la asociación entre factores socioambientales y la práctica de actividad física en mujeres embarazadas.

Materiales y métodos: estudio de corte transversal realizado en mujeres gestantes sin contraindicaciones para realizar actividad física, que asistían a la consulta prenatal, pertenecientes a dos instituciones de salud de la ciudad de Barranquilla y otra de la ciudad de Cartagena de Indias, Colombia. El muestreo fue intencional. Se evaluaron las características sociodemográficas, los niveles de actividad física y la percepción de factores socioambientales como infraestructura del barrio, las cualidades estéticas, el ambiente social, la conexión entre las calles, la seguridad y tráfico en el barrio. Se estimó la razón de odds (OR).

Resultados: de un total de 228 mujeres gestantes se incluyeron 208 en el análisis. El 62% de las gestantes no cumplen las recomendaciones de actividad física para mantener su salud. Entre los factores socioambientales relacionados con la inactividad física de las embarazadas están el residir a mucha distancia de tiendas y supermercados para ir caminando (OR = 5,1; IC 95 %: 2,8-9,4); presencia de aceras en mal estado en las calles (OR = 3,4; IC 95 %: 1,9-6,3); pocas personas físicamente activas en el barrio (OR = 4,1; IC 95 %: 2,2-7,5); inseguridad en el día y en la noche para caminar (OR = 3,6; IC 95 %: 1,9-6,4).

Conclusión: la percepción de las características socioambientales está asociada a la actividad física de las gestantes. Se requieren intervenciones que mejoren las características socioambientales que afectan la percepción de estos factores en la población, para evaluar su efecto en la actividad física de las gestantes.

Palabras clave: actividad motora, ambiente, embarazo.

INTRODUCTION

Physical activity (PA) has been defined by the World Health Organization (WHO) as any bodily move-

ment produced by skeletal muscles that requires energy expenditure (1). During gestation, physical activity becomes particularly important because during this period there are various anatomical-physiological and psychic changes that require constant adaptation of the pregnant women to perform her activities (2). According to the WHO (3) recommendations, regular physical activity is beneficial to health, regardless of age. During gestation, physical activity is extremely important because of the multiple benefits it contributes, both to the mother and to the baby, including gestational diabetes prevention and control, controlling excessive body weight, less back and pelvic pain, less depression during pregnancy and after delivery, inter alia (2, 4).

Notwithstanding the recommendations of the American College of Obstetrics and Gynecology (ACOG) on the safe practice of physical activity, at least 150 minutes per week of mild intensity aerobics (5), few pregnant women comply with the minimal recommendations of physical activity during pregnancy. Several studies in various countries report low frequencies of physical activity in pregnancy; in Chile, only 20.3 % are sufficiently active (6); in the United States, 70 % reported no moderate or vigorous physical activity (7), whilst in China, only 11.1 % complied with the physical activity guidelines during pregnancy (8).

Studies on physical activity in pregnancy report the use of different assessment questionnaires (6); one of these is the International Physical Activity Questionnaire (IPAQ), which in its short version includes questions about walking, moderate and vigorous physical activity, as well as sedentary behavior, in order to classify the study subjects as: inactive, regularly active, and very active. This questionnaire has been validated in several countries, including a few in Latin America and Central America, and has shown adequate reliability (8, 9-11).

The low levels of physical activity in pregnancy may be accounted for with the ecology model and socio-environmental factors. The former suggests

the interrelation of individual and environmental factors as the drivers of a physically active lifestyle; in other words, a neighborhood environment where people contribute to the development of healthy lifestyles - adequate sidewalks, low traffic, and security in the area, among others - to promote walking and cycling. The ecology model orients the interventions to promote healthy lifestyles based on the inclusion of intrapersonal, interpersonal, institutional, and community factors, emphasizing the need to make changes in the social and physical environment that lead to individual behavioral changes (12, 13). The socio-environmental drivers involve the physical and social environment where people live, which may promote or hinder adequate and safe physical activity. Pleasant landscapes, other people doing physical activity, nearby parks, are all factors positively associated with an active lifestyle (14). A poorly developed physical environment has been associated with premature labor, weight gain during pregnancy, and low birth weight babies (15, 16).

Down *et al.* consider that understanding the impact of environmental factors that promote or hinder the participation of pregnant women in physical activities is fundamental to guide the planning and implementation of the interventions, at multiple socio-ecological levels (17). Few studies in Colombia address the impact of socio-environmental factors on physical activity during pregnancy. For this reason, the objectives of this study were to establish the levels of physical activity and their association with the perception of socio-environmental factors in a group of pregnant women.

MATERIALS AND METHODS

This is an analytic, cross-section study in pregnant women who visited the prenatal consultation with no contraindications for physical activity and voluntarily accepted to participate in the study. The selection process was conducted from January to April 2016, with the participation of primary care institutions in the cities of Barranquilla and Cartagena de Indias, in the Colombian Caribbean

coast. Both institutions serve the population under the Government subsidized social security system in Colombia. The sampling was non-probabilistic and intentional and all of the pregnant women were selected during the study period.

Procedure. Pregnant women who met the selection criteria were identified in the waiting rooms of each institution. Those who accepted to participate in the study, signed an informed consent and the evaluation instruments were administered by experienced investigators who measured the study variables: a survey enquired about the socio-demographic characteristics of the pregnant women; the International Physical Activity Questionnaire (IPAQ short version) to measure the level of physical activity, taking as a reference for classification the IPAQ guidelines (18). In order to measure the perception of the social and physical environment of the neighborhood, the International Physical Activity Study (IPAS) Environment Module was used, which comprises sixteen questions on the neighborhood environmental factors. The questions of the module are based on a 4-point Likert type scale: Totally disagree, disagree, agree, totally agree. This instrument has been used in other studies (13) and intra-class correlation coefficients have been reported between 0.43 to 0.91 (19). The IPAS allowed for the evaluation of the socio-environmental characteristics such as: neighborhood infrastructure, aesthetic qualities, the social environment, road interconnectivity, security and traffic.

The age, the socio-economic status, the marital status, and the level of education were measured. The IPAQ enabled the classification into high, medium, and low levels of physical activity, based on whether the subjects met the recommendation of 150 minutes of moderate physical activity over the week. IPAC also estimated the sedentary behavior in min/day, and the energy expenditure expressed in Metabolic Equivalent of Task (MET), which corresponds to the unit to measure the metabolic index. In accordance with the current recommendations, a physically active pregnant woman is a

woman with a physical expenditure greater than 450 MET per week. The cut point of 450 MET was defined based on the multiplication of a minimum consumption of 3 MET of moderate physical activity for 150 minutes per week that a pregnant woman must complete to be physically active. The measured socio-environmental characteristics of the neighborhood included: availability of sidewalks, bicycle facilities in the neighborhood, recreational areas in the neighborhood, traffic level to walk or ride the bicycle, presence of physically active people in the neighborhood, and perception of security to walk or ride a bicycle. The endpoint was the practice of a physical activity classified as follows: high and medium for active pregnant women and low physical activity for inactive. A high level involved a pregnant woman who practiced over 300 minutes per week of moderate intensity physical activity; a medium level was between 150 and 300 minutes of moderate intensity physical activity per week, and a low level was less than 50 minutes per week.

Statistical analysis. Using the SPSS version 24 of the statistical software, the frequency of the categorical variables was established: socio-demographic characteristics and the levels of physical activity. The Kolmogorov-Smirnov (K-S) test was administered to check the distribution of the continuous variables: energy expenditure and sedentary behavior of the participants and defining the type of measurement of central and scattered tendencies. In order to identify the socio-environmental factors associated with the level of physical activity (active/inactive), a bivariate logistical regression was conducted for establishing the Odds Ratio (OR) and a confidence interval (CI) of 95%. The model considered the perception of the socio-environmental characteristics of the neighborhood as the exposure variable, while the practice of physical activity was the outcome variable.

The study was approved by the Ethics Committee of the Simón Bolívar University in Barranquilla. Funding for this project was provided by the researchers and the University.

RESULTS

The total number of pregnant women participating was 208, but 20 were excluded: 5 failed to complete the surveys and 15 had a recommendation to refrain from doing any physical exercise. 119 were affiliated to the Healthcare Provider Institutions in Barranquilla. The mean age of the pregnant women was 23.6 ± 6.51 years; 66.3% were in the age range between 18 and 29 years of age. Table 1 shows the socio-demographic characteristics of the participants. 71.2% were from socio-economic level 1, 65.9% were common-law marriage, 31.3% reported having completed high school education, and 84.6% were unemployed.

In terms of the level of physical activity, 62% of the pregnant women had a low level of physical activity and 15.4% a medium level. There was no vigorous physical activity (0 minutes), and therefore there were no metabolic equivalents (MET) of vigorous exercise; the type of physical activity that contributes the most to energy expenditure is walking (156,7 MET). This is consistent with the total number of minutes walking per week (47.5 min). At least 50% of the patients reported a sedentary lifestyle, with over 6 hours sitting or lying down per day (table 2).

Table 3 illustrates the relationship between the levels of physical activity and the socio-environmental drivers. The risk factors identified for a low physical activity were living far away from shops and supermarkets to walk or cycle (OR = 5.1; 95% CI: 2.8-9.4); sidewalks in poor condition (OR = 3.4; 95% CI: 1.9-6.3); the perception of few people physically active in the neighborhood (OR = 4.1; 95% CI: 2.2-7.5); and insecure neighborhood during the day or evening to walk or ride a bicycle (OR = 3.6; 95% CI: 1,9-6,4).

DISCUSSION

Our results indicate that over 60% of the pregnant women participating in the study fail to comply with the expert recommendations of at least 150 minutes of moderate intensity aerobics physical activity,

Table 1.
Socio-demographic characteristics of the pregnant women participating in the physical activity trial in Barranquilla and Cartagena, Colombia, 2016

Age range	n = 208	(%)
12-17 years	29	13,9
18-29 years	138	66,3
30-39 years	41	19,7
Socio-economic level		
Level 1	148	71,2
Level 2	47	22,6
Level 3	12	5,8
Level 4	1	0,5
Marital Status		
Single	40	19,2
Married	28	13,5
Common law marriage	137	65,9
Separated/Divorced	2	1,0
Widow	1	0,5
Level of education		
Incomplete elementary school	7	3,4
Complete elementary school	14	6,7
Complete high school	65	31,3
Incomplete high school	52	25,0
Technical /Technologist	35	16,8
University studies	24	11,5
Postgraduate	11	5,3
Occupation		
Employee	32	15,4
Unemployed	176	84,6

preferably fast walking (3, 20). Sedentary lifestyle scores high, with half of the pregnant women spending over 6 hours sitting or lying down. A significant association was identified between some socio-environmental characteristics of the neighborhood

and the low levels of physical activity of the pregnant women, including: few friends, neighbors, and family doing physical activities in the neighborhood; insecure place to walk, poor condition of sidewalks, and few stores and supermarkets close to their homes.

Table 2.
Patterns of physical activity and sedentary lifestyle in pregnant women in Barranquilla and Cartagena, Colombia, 2016

Levels of physical activity	n = 208 Frequency	Percentage
High	47	22,6
Medium	32	15,4
Low	129	62
Energy expenditure (MET)	Median	Interquartile range
MET moderate activities	32	360
MET walking	156.7	280,5
MET/weekly	114.5	231
Min/Week of physical activity	Median	Interquartile range
Total min/week moderate activities	8	90
Total min/week walking	47.5	85
Total min/weekly	107	225
Sedentary lifestyle	Median	Interquartile range
Time sitting per day	360 min (6 hours)	240
Time sitting per week	2520 min (42 hours)	1680

Our findings are consistent with the findings of other studies in terms of women tending to reduce the level, duration, and intensity of physical activity during pregnancy. The Lindqvist trial (21) reports that 52.9% failed to accomplish the recommended level of physical activity. With regards to the minutes of physical activity accumulated during the week, our pregnant women show a much lower level than the level described in the paper by Leppe *et al.* (6), according to which pregnant women accumulated 154 minutes per week in average, 64.4% claimed to do vigorous physical exercise, and 22% moderate physical activity.

With regards to sedentary lifestyle, our observations show higher sedentary behavior than that reported by Hawkins *et al.* (22), comparing sedentary behavior in pregnant and non-pregnant women, and

found that among the latter group the sedentary behavior was more significant, and accumulated in episodes of ≥ 30 min during the day.

Likewise, walking represents the highest energy expenditure and number of minutes of physical activity per week, as compared against other moderate activities at home, in the job or leisure time. This is a favorable result since walking has been reported as a healthy, free of cost, and accessible practice during leisure time, or as a mode of transportation for people. In this regard, the city environment becomes relevant, since certain aspects such as the proximity and diversity of shops, services, workplace, schools and green spaces become facilitators or hindrances to walk, as a mode of physical activity that contributes to health and quality of life of pregnant women.

Table 3.
Socio-environmental drivers for physical activity in pregnant women in Barranquilla and Cartagena, Colombia, 2016

	General population n = 208	Inactive n = 129	Active n = 79	OR; 95% CI
Many places such as stores and supermarkets at a short walking distance				
Disagree	116 (55.8%)	91 (78.4%)	25 (21.6%)	5.1 (2.8-9.4)
Agree	92 (44.2%)	38 (41.3%)	54 (58.7%)	
Proper sidewalks				
Disagree	73 (35.1%)	48 (65.8%)	25 (34.2%)	3.4 (1.9-6.3)
Agree	135 (64.9%)	48 (35.6%)	87 (64.4%)	
Bicycle facilities in the neighborhood				
Disagree	161 (77.4%)	99 (61.5%)	62 (38.5%)	0.90 (0.4-1.7)
Agree	47 (22.1%)	30 (18.6%)	17 (81.4%)	
Recreational facilities in the neighborhood				
Disagreement	130 (62.5%)	79 (60.8%)	51 (39.2%)	0.9 (0.5-1.5)
Agreement	78 (37.5%)	50 (64.1%)	28 (35.9%)	
Less traffic for walking or cycling				
Disagreement	109 (52.4%)	70 (64.2%)	36 (35.8%)	1.4 (0.8-2.5)
Agreement	99 (47.6%)	59 (59.6%)	43 (40.4%)	
Physically active people in the neighborhood				
Disagreement	95 (45.7%)	75 (78.9%)	20 (21.1%)	4.1 (2.2-7.5)
Agreement	113 (54.3%)	54 (47.8%)	59 (52.2%)	
Safe for walking or cycling				
Disagreement	128 (61.5%)	94 (73.4%)	34 (26.6%)	3.6 (1.9-6.4)
Agreement	80 (38.5%)	35 (27.3%)	45 (72.7%)	

Other studies confirm that the perception of an optimal social or physical environment is essential to walk as a recreational activity or as a mode of transportation (23, 24).

Our findings regarding the level of physical activity could be related to the type of population included which was from a low socio-economic

level. It has been described that among low income people it is harder to identify community drivers supporting positive healthy behaviors (25). This population has less open areas available, with well maintained parks, and green areas for physical activities that offer more opportunities for socializing and learning about preventive behaviors

that promote the development of healthy lifestyles (25). In terms of the socio-environmental drivers, a study conducted in the United States describes a positive correlation between walking and the characteristics of the community; i.e., appropriate sidewalks. However, an inverse relationship was found with many intersecting roads (26).

This study found that the perception about stores and supermarkets at a short distance from home or the workplace, gives the pregnant woman the opportunity to walk more often; this is consistent with the study by Laraia *et al.* (16), that reports that women living very far (4 km) from supermarkets, had an increased chance of gaining weight, probably because the further the distance from the places where people usually conduct their daily activities, the higher the use of motor vehicles and less walking or riding a bicycle. With regards to insecurity which is perceived more intensively by physically inactive pregnant women, this is another factor also studied by other authors (16, 27), claiming that fear of crime generates additional stress in the pregnant women, leading to avoidance of open recreational spaces such as parks, squares or pedestrian roads for walking. Consequently, the perception about security in the neighborhood is important information for making recommendations about physical activity during pregnancy.

The major limitation in this study was the non-random selection of the sample, which limits the generalization of the results. Another limitation is the cross-sectional nature of the design that prevents making causal associations because of the failure to meet the time criterion. The strength is that this is an innovative study in the country and the region.

CONCLUSIONS

Most of the pregnant women participating in the study have low levels of physical activity that are related to socio-environmental factors, such as living far from the shopping areas and supermarkets

to go walking or riding a bicycle. Sidewalks in poor conditions; the perception of few people who are physically active in the neighborhood during the day and night for walking or cycling. Consequently, it is absolutely necessary to implement multi-level health promotion strategies directed at achieving permanent healthy lifestyles in pregnant women.

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