



Physical Activity among Pregnant Women During the Last Trimester and Its Associated Factors

Hend Magdy Mohamed Gomaa; Ahmed El Menayyer; Kamel NM; Shymaa EL-Oraby

Public Health & Preventive Medicine, Community Medicine Department, Faculty of Medicine, Mansoura University, Egypt.

ABSTRACT

Submission Date:

2023-05-23

Revision Date:

2023-07-02

Acceptance Date:

2023-07-03

Key Words:

Physical activity, exercise, pregnancy, third trimester, Egypt

Background: Studies showed that many women probably don't engage in enough physical activity during pregnancy. Physical activity can greatly contribute to the well-being of both the mother and her baby. **Objective:** To estimate pregnant women's level of physical activity and its determinants. **Methods:** A cross-sectional study was conducted on pregnant females during the last trimester in Mansoura University Hospital, Gynaecology, and Obstetric Department during the year 2022. Data were collected using a semi-structured questionnaire assessing physical activity in different situations including tasks related to managing a household and providing care, transportation activities and inactivity, sports activities, and activities during work. **Results:** Total 386 pregnant females were included with average age 27.9 ± 6.5 years. Approximately 38.6% were housewives, 42.0% employees, and 19.4% manual workers, 50.8% rural residents, and 31.6% university education or higher. Approximately 7.5% had gestational hypertension, 13% gestational diabetes, 35.8% anaemia, 16.3% other comorbidity, and 3.4% smokers. Prevalence of insufficient physical activity assessed during out-of-work, going places, fun or exercise, at work, and overall was 87%, 87.6%, 89.6%, 92% & 95.6%, respectively. Approximately 58% self-rated their physical activity before pregnancy as insufficient. Multivariate analysis showed that caesarean delivery, insufficient self-rated pre-pregnancy level of physical activity, absence of hypertension during pregnancy, increased body mass index are significant predictors of low to moderate overall physical activity. **Conclusions:** The study findings underscore the extremely high level of physical inactivity among pregnant females attending University Hospital in Egypt. There is urgent need for preventive and educational programs targeting pregnant women in their last trimester.

INTRODUCTION

The fourth-leading cause of mortality globally is physical inactivity which is also recognized as an important risk to the public's health.¹ Physical activity during pregnancy is safe and of value for both the pregnant woman and her fetus. No direct relation was detected to cause adverse pregnancy outcomes, but it can maintain or improve fitness and may further improve pregnancy outcomes.² Physical activity reduces the risk of pre-eclampsia, pelvic and back pain and also decreases weight gain during pregnancy, and

increases well-being.³ However, there is inadequate data to draw the conclusion that exercise protects against gestational diabetes mellitus or pregnancy-related glucose intolerance. While pregnant women are advised by healthcare professionals to maintain or increase their physical activity, they frequently decrease it.⁴

Guidelines for physical activity National standards in several countries encourage specific levels of physical activity during pregnancy, taking into account physical

Corresponding Author: Hend Magdy Mohamed Gomaa, Department of Public Health & Preventive Medicine, Community Medicine Department, Faculty of Medicine, Mansoura University, Egypt. Email: hendmagdy86@hotmail.com

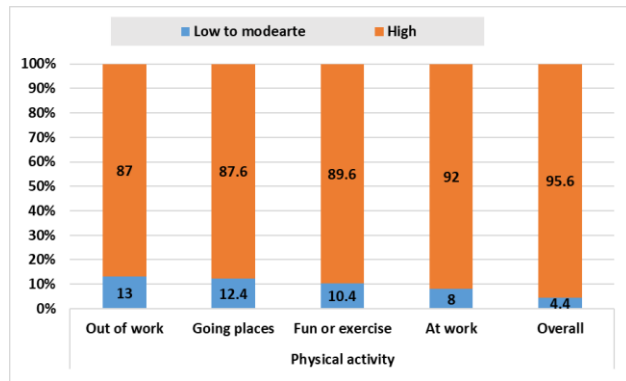


Figure 1: Distribution of the studied pregnant females according to their level of physical activity as a protective factor. The World Health Organization (WHO) recommends that people between the ages of 18 and 64 engage in at least 75 minutes of vigorous-intensity aerobic physical activity per week or 150 minutes of moderate-intensity aerobic physical activity per week (performed in bouts of at least 10 minutes each). Women who are expecting adverse effects should consult a physician before attempting to follow these suggestions.¹ To the best of the authors' knowledge, there are no previous studies on physical activity during pregnancy in Egypt. The objective of the current study was to estimate pregnant women's physical activity and its determinants.

METHODS

A cross-sectional study with an analytic component was carried out in Mansoura University Hospital, Gynecology, and Obstetric Department. The study was carried out through the year 2022 on pregnant females during the last trimester.

Sample size calculations were based on the prevalence of low physical activity among pregnant females retrieved from previous research.⁵ Using Epi info version 7.2.4.0 to calculate sample size based on 47.2% prevalence of low physical activity during pregnancy, 95% CL with an acceptable margin of error of 5% then the total sample size will be at least 383.

Data collection tool: The semi-structured questionnaire was used to assess level of pregnant females' physical activity that are interviewed during the last trimester and early labor about physical activity during the previous three trimesters. The questionnaire includes; Socio-demographic, medical comorbidities, obstetric history, Arabic version of the

Pregnancy Physical Activity Questionnaire (PPAQ),⁶ and Anthropometric measurements. Socio-demographic, medical comorbidities (e.g., anemia, cardiac, renal), and obstetric history of the studied women collected from their medical records in the hospital. PPAQ⁶ was used to assess time spent in 33 different activities divided as follows: (1) sixteen activities dealing with household and caregiving (out-of-work activities), (2) three concerning transportation and inactivity (going places), (3) nine sports-related activities (fun and exercise), and (4) five occupational activities (at work activity). Every individual selects the option that best corresponds to the amount of time they have spent on a daily or weekly basis in the past three months doing the previous activities, 6 possible answers (never, <0.5 hours per day, from 0.5 to 1 hour per day, 1 to 2 hours per day, 2 to 3 hours a day, ≥ 3 hours a day). For the calculation of time spent in each activity; multiplication of number of days per week by minutes spent doing the activity per day then total weekly physical activity was calculated by multiplying the number of minutes spent in each activity category with the specific Metabolic Equivalent of Task (MET) score for each activity. Scores for walking and moderate and vigorous activities are the sum of corresponding item scores. To calculate MET minutes a week, multiply the MET value given (walking = 3.3, moderate activity = 4, vigorous activity = 8) by the minutes the activity was carried out and again by the number of days that activity was undertaken. A minimum total physical activity of 3000 at least was considered high physical activity and less than 3000 was considered low to moderate.⁶ Content validity of questionnaires was assessed by a group of 4 experts in the field of public health and 2 in the field of Gynecology & obstetrics. Questions of the studied questionnaire were assessed for relevance and clarity with the item validity index being excellent for all questions ranging from 0.92 to 1. Scale validity index was assessed to be 0.95. Cronbach alpha for the questionnaire was assessed to be 0.85. Body mass index was assessed.

Data Analysis: Statistical Package for Social Sciences (SPSS) IBM version 25 was used for data analysis after data entry and proper coding. Categorical variables were described as frequencies and relative frequencies as the level of physical activity. Statistical tests were

Table (1): Factors affecting low to moderate physical activity assessed out of work among pregnant females

	Total n=386	Physical activity out of work		Univariate analysis		Multivariate analysis	
		High n=50	Low to moderate n=336	P value	COR (95% CI)	P value	AOR (95% CI)
Age/years							
18- (R)	216	27 (12.5)	189 (87.5)	0.927	1		
26-	107	15 (14.0)	92 (86.0)	0.703	0.876 (0.445-1.73)		
34-	63	8 (12.7)	55 (87.3)	0.967	0.982 (0.422-2.29)		
Occupation							
Housewife (R)	149	15 (10.1)	134 (89.9)	0.286	1		
Employee	162	26 (16.0)	136 (84.0)	0.122	0.586 (0.297-1.15)		
Manual worker	75	9 (12.0)	66 (88.0)	0.659	0.821 (0.341-1.97)		
Residence							
Rural (R)	196	27 (13.8)	169 (86.2)	0.625	1		
Urban	190	23 (12.1)	167 (87.9)		1.16 (0.639-2.11)		
Educational level							
Illiterate &Primary	87	6 (6.9)	81 (93.1)	0.207	1.89 (0.703-5.09)		
Middle education	177	29 (16.4)	148 (83.6)	0.328	0.715 (0.366-1.4)		
University and higher (R)	122	15 (12.3)	107 (87.7)	0.105			
Parity							
Nulli para (R)	130	22 (16.9)	108 (83.1)	0.326	1		
1-3	246	28 (11.4)	218 (88.6)	0.135	1.58 (0.867-2.90)		
>3	10	0	10 (100)	0.999	undefined		
Gravidity							
Nulli gravida (R)	30	3 (10.0)	27 (90.0)	0.688	1		
1-3	298	41 (13.8)	257 (86.2)	0.567	0.696 (0.202-2.40)		
>3	58	6 (10.3)	52 (89.7)	0.960	0.963 (0.223-4.15)		
History of abortion							
No (R)	370	48 (13.0)	322 (87.0)	0.956	1		
Yes	16	2 (12.5)	14 (87.5)		1.04 (0.23-4.73)		
Mode of delivery at last pregnancy							
Vaginal (R)	65	14 (21.5)	51 (78.5)	0.002*	1	0.001*	1
Cesarean delivery	191	14 (7.3)	177 (92.7)		3.47 (1.55-7.75)		3.92 (1.72-8.91)
Smoking history							
Nonsmoker (R)	373	47 (12.6)	326 (87.4)	0.269	1		
Smoker	13	3 (23.1)	10 (76.9)		0.481 (0.128-1.81)		
Self-rated pre-pregnancy level of physical activity							
Sufficient	161	23 (14.3)	138 (85.7)	0.510	1.22 (0.673-2.22)		
Insufficient (R)	225	27 (12.0)	198 (88.0)				
Gestational DM	50	5 (10)	45 (90)	0.505	1.39 (0.525-3.69)		
Gestational hypertension	29	4 (13.8)	25 (86.2)	0.898	0.930 (0.310-2.79)		
Anemia	138	24 (17.4)	114 (82.6)	0.053	0.556 (0.306-1.01)		
Medical history of disease	63	3 (4.8)	60 (95.2)	0.03*	3.04 (1.03-11.31)	0.034*	9.08 (1.18-69.69)
BMI (Mean ±SD)	386	28.9±3.4	29.27±3.55	0.512	1.03 (0.945-1.12)		

COR: Crude odds ratio, AOR: Adjusted odds ratio, BMI, body mass index

used as; Chi-Square, Monte Carlo & Fischer exact tests for categorical variables, independentt-tests were used for comparison between groups. Binary stepwise logistic regression analysis was used for the prediction of independent variables of low to moderate physical activity. Significant predictors in the bivariate analysis were entered into the regression model.

RESULTS

The present study was carried out on 386 pregnant females in the last trimester with a mean (SD) age of 27.85 (6.45) years with 38.6% being housewives, 42.0% employees, and 19.4% being manual workers, 50.8% rural residents, 22.5% primary education or illiterate, 45.9% middle education and 31.6% university education or higher. Of the studied females 33.7% are nullipara, 63.7% were from primipara to

Table 2: Factors affecting low to moderate physical activity assessed during going places among pregnant females.

	Total n=386	Physical activity out of work		Univariate analysis		Multivariate analysis	
		High n=48	Low to moderate n=338	P value	COR (95% CI)	P value	AOR (95% CI)
Age/years							
18- (R)	216	24 (11.1)	192 (88.9)	0.102	1.88 (0.88-4.02)		
26-	107	12 (11.2)	95 (88.8)	0.161	1.86 (0.781-4.44)		
34-	63	12 (19.0)	51 (81.0)	0.229	1		
Occupation							
Housewife (R)	149	16 (10.7)	133 (89.3)	0.777	1.13 (0.476-2.70)		
Employee	162	23 (14.2)	139 (85.8)	0.646	0.824 (0.361-1.88)		
Manual worker	75	9 (12.0)	66 (88.0)	0.649	1		
Residence							
Rural (R)	196	24 (12.2)	172 (87.8)	0.908	1.04 (0.566-1.89)		
Urban	190	24 (12.6)	166 (87.4)		1		
Educational level							
Illiterate & Primary	87	8 (9.2)	79 (90.8)	0.234	1.71 (0.707-4.13)		
Middle education	177	22 (12.4)	155 (87.6)	0.562	1.22 (0.624-2.38)		
University and higher (R)	122	18 (14.8)	104 (85.2)	0.491	1		
Parity							
Nulli para (R)	130	12 (9.2)	118 (90.8)	0.334	1		
1-3	246	36 (14.6)	210 (85.4)	0.139	0.593 (0.297-1.18)		
>3	10	0	10 (100)	0.999	Undefined		
Gravidity							
Nulli gravida (R)	30	1 (3.3)	29 (96.7)	0.781	3.98 (0.466-33.98)		
1-3	298	40 (13.4)	258 (86.6)	0.340	0.885 (0.376-2.09)		
>3	58	7 (12.1)	51 (87.9)	0.207	1		
History of abortion							
No (R)	370	45 (12.2)	325 (87.8)	0.434	1		
Yes	16	3 (18.8)	13 (81.2)		1.67 (0.457-6.08)		
Mode of delivery at last pregnancy							
Vaginal (R)	65	17 (26.2)	48 (73.8)	0.001*	3.21 (1.55-6.64)	0.058	1 2.97 (0.9649.14)
Cesarean delivery	191	19 (9.9)	172 (90.1)				
Smoking history							
Non smoker (R)	373	45 (12.1)	328 (87.9)	0.237	0.457 (0.121-1.72)		
Smoker	13	3 (23.1)	10 (76.9)		1		
Self-rated pre-pregnancy level of physical activity							
Sufficient	161	23 (14.3)	138 (85.7)	0.351	1		
Insufficient (R)	225	25 (11.1)	200 (88.9)		1.33 (0.727-2.45)		
Gestational DM	50	4 (8.0)	46 (92.0)	0.308	1.73 (0.595-5.05)		
Gestational hypertension	29	3 (10.3)	26 (89.7)	0.746	1.23 (0.356-4.22)		
Anemia	138	24 (17.4)	114 (82.6)	0.02*	0.51 (0.28-0.94)	0.702	0.80 (0.26-2.47)
Medical history of disease	63	5 (7.9)	58 (92.1)	0.237	1.78 (0.676-4.69)		
BMI (Mean ±SD)	386	28.67±3.11	29.30±3.58	0.241	1.05 (0.966-1.15)		

COR: Crude odds ratio, AOR: Adjusted odds ratio, BMI, body mass index. Overall % predicted=89.1%

third para and 7.8% are nulli gravida and 77.2% from primigravida to third gravida. Fifty-eight (58%) percent of the studied females rate their level of physical activity as insufficient, 7.5% have gestational hypertension and 13% gestational diabetes, 35.8% anemic, 16.3% have a medical history, and 3.4% are smokers. Prevalence of insufficient physical activity assessed during out-of-work, going places, fun or exercise, at work and the total was 87%, 87.6%,

89.6%, 92% & 95.6%, respectively as shown in Figure 1.

Cesarean section as a mode of delivery during the last pregnancy and positive medical history of disease were statistically significant determinants of low to moderate physical activity out of work with an adjusted odds ratio (3.92 & 9.08, respectively) and percent predicted was 89.1% (Table 1).

Cesarean section as a mode of delivery during the last pregnancy and non-anemic females were statistically

Table 3: Factors affecting low to moderate physical activity as fun or exercise among pregnant females.

	Total n=386	Physical activity out of work		Univariate analysis		Multivariate analysis	
		High n=40	Low to moderate n=346	P value	COR (95% CI)	P value	AOR (95% CI)
Age/years							
18- (R)	216	17 (7.9)	199 (92.1)	0.013*	2.75 (1.24-6.1)	0.88	1.08 (0.381-3.08)
26-	107	11 (10.3)	96 (89.7)	0.111	2.05 (0.847-4.98)	0.643	1.31 (0.414-4.17)
34-	63	12 (19.0)	51 (81.0)	0.045*	1		1
Occupation							
Housewife (R)	149	16 (10.7)	133 (89.3)	0.132	1		
Employee	162	21 (13.0)	141 (87.0)	0.545	0.808 (0.404-1.61)		
Manual worker	75	3 (4.0)	72 (96.0)	0.101	2.88 (0.814-10.24)		
Residence							
Rural (R)	196	20 (10.2)	176 (89.8)	0.917	1.04 (0.538-1.99)		
Urban	190	20 (10.5)	170 (89.5)		1		
Educational level							
Illiterate & Primary	87	7 (8.0)	80 (92.0)	0.805	1.13 (0.42-3.05)		
Middle education	177	22 (12.4)	155 (87.6)	0.357	0.698 (0.325-1.49)		
University and higher (R)	122	11 (9.0)	111 (91.0)	0.464	1		
Parity							
Nulli para (R)	130	11 (8.5)	119 (91.5)	0.612	1		
1-3	246	29 (11.8)	217 (88.2)	0.322	0.692 (0.334-1.43)		
>3	10	0	10 (100)	0.999	Undefined		
Gravidity							
Nulli gravida (R)	30	3 (10.0)	27 (90.0)	0.638	1		
1-3	298	33 (11.1)	265 (88.9)	0.858	0.892 (0.257-3.10)		
>3	58	4 (6.9)	54 (93.1)	0.612	1.5 (0.313-7.19)		
History of abortion							
No (R)	370	39 (10.5)	331 (89.5)	0.581	1		
Yes	16	1 (6.2)	15 (93.8)		1.77 (0.227-13.75)		
Mode of delivery at last pregnancy							
Vaginal (R)	65	14 (21.5)	51 (78.5)	0.003*	1	0.053	1
Cesarean delivery	191	15 (7.9)	176 (92.1)		3.22 (1.46-7.11)		3.06 (0.984-9.5)
Smoking history							
Nonsmoker (R)	373	38 (10.2)	335 (89.8)	0.546	1		
Smoker	13	2 (15.4)	11 (84.6)		0.624 (0.133-2.92)		
Self-rated pre-pregnancy level of physical activity							
Sufficient	161	20 (12.4)	141 (87.6)	0.261	1		
Insufficient (R)	225	20 (8.9)	205 (91.1)		1.45 (0.755-2.80)		
Gestational DM	50	4 (8.0)	46 (92.0)	0.557	1.38 (0.469-4.06)		
Gestational hypertension	29	4 (13.8)	25 (86.2)	0.500	0.684 (0.225-2.08)		
Anemia	138	22 (15.9)	116 (84.1)	0.007*	0.413 (0.213-0.80)	0.727	0.82 (0.26-2.53)
Medical history of disease	63	5 (7.9)	58 (92.1)	0.490	1.41 (0.530-3.75)		
BMI (Mean ±SD)	386	28.38±4.02	29.32±3.45	0.107	1.08 (0.983-1.18)		

COR: Crude odds ratio, AOR: Adjusted odds ratio, BMI, body mass index. Overall % predicted=89.1%.

significant predictors of low to moderate physical activity during going places with an adjusted odds ratio (2.97 & 0.803, respectively) and percent predicted for the combination of factors was 89.1% (Table 2).

Pregnant aged from 18 years to less than 26 years, cesarean section as a mode of delivery during the last pregnancy, and non-anemic females were statistically significantly associated with low to moderate physical activity as fun or exercise as shown in (Table 3).

For working females (n=237); insufficient physical activity pre-pregnancy (self-rated by the pregnant female) is statistically significantly associated with low to moderate physical activity (odds ratio=4.47), as shown in table 4.

Bivariate analysis of the factors affecting the overall level of physical activity illustrates that age from 18 to less than 26 and from 26 to less than 34 years, Cesarean section as a mode of delivery during the last pregnancy, non-smokers, insufficient self-rated pre-

Table 4: Factors affecting low to moderate physical activity at work among pregnant females

	Total n=237	Physical activity out of work		Univariate analysis		Multivariate analysis	
		High n=19	Low to moderate n=218	P value	COR (95% CI)	P value	AOR (95% CI)
Age/years							
18- (R)	139	14 (10.1)	125 (89.9)	139	14 (10.1)	0.368	1
26-	69	3 (4.3)	66 (95.7)	69	3 (4.3)	0.168	2.46 (0.684-8.88)
34-	29	2 (6.9)	27 (93.1)	29	2 (6.9)	0.598	1.51 (0.325-7.05)
Occupation							
Employee (R)	162	13 (8.0)	149 (92.0)	162	13 (8.0)	0.995	1
Manual worker	75	6 (8.0)	69 (92.0)	75	6 (8.0)		1.003 (0.37-2.75)
Residence							
Rural (R)	139	11 (7.9)	128 (92.1)	139	11 (7.9)	0.944	1
Urban	98	8 (8.2)	90 (91.8)	98	8 (8.2)		0.967 (0.37-2.49)
Educational level							
Illiterate & Primary	51	2 (3.9)	49 (96.1)	51	2 (3.9)	0.470	1
Middle education	127	11 (8.7)	116 (91.3)	127	11 (8.7)	0.284	0.430 (0.09-2.01)
University and higher (R)	59	6 (10.2)	53 (89.8)	59	6 (10.2)	0.225	0.361 (0.07-1.87)
Parity							
Nulli para (R)	95	5 (5.3)	90 (94.7)	95	5 (5.3)	0.446	1
1-3	141	14 (9.9)	127 (90.1)	141	14 (9.9)	0.204	0.504 (0.18-1.45)
>3	1	0	1 (100)	1	0	1.0	Undefined
Gravidity							
Nulli gravida (R)	25	0	25 (100)	25	0	0.790	Undefined
1-3	179	15 (8.4)	164 (91.6)	179	15 (8.4)	0.998	Undefined
>3	33	4 (12.1)	29 (87.9)	33	4 (12.1)	0.998	Undefined
History of abortion							
No (R)	229	17 (7.4)	212 (92.6)	229	17 (7.4)	0.072	1
Yes	8	2 (25)	6 (75.0)	8	2 (25)		0.241 (0.05-1.28)
Mode of delivery at last pregnancy							
Vaginal (R)	41	4 (9.8)	37 (90.2)	41	4 (9.8)	0.979	1.02 (0.30-3.45)
Cesarean delivery	101	10 (9.9)	91 (90.1)	101	10 (9.9)		1
Smoking history							
Nonsmoker (R)	226	19 (8.4)	207 (91.6)	226	19 (8.4)	0.316	1
Smoker	11	0	11 (100)	11	0		Undefined
Self-rated pre-pregnancy level of physical activity							
Sufficient	98	14 (14.3)	84 (85.7)	98	14 (14.3)	0.003*	1
Insufficient (R)	139	5 (3.6)	134 (96.4)	139	5 (3.6)		4.47 (1.55-12.85)
Gestational DM	27	3 (11.1)	24 (88.9)	27	3 (11.1)	0.529	0.660 (0.18-2.43)
Gestational hypertension	19	1 (5.3)	18 (94.7)	19	1 (5.3)	0.682	1.54 (0.19-12.23)
Anemia	82	7 (8.5)	75 (91.5)	82	7 (8.5)	0.830	0.899 (0.34-2.38)
Medical history of disease	37	2 (5.4)	35 (94.6)	37	2 (5.4)	0.524	1.62 (0.359-7.35)
BMI (Mean ±SD)	237	28.38±4.02	29.32±3.46	237	28.38±4.02	0.107	1.08 (0.944-1.25)

COR: Crude odds ratio, AOR: Adjusted odds ratio, BMI, body mass index.

pregnancy level of physical activity, absence of gestational hypertension and higher body mass index are statistically significantly related to low to moderate overall physical activity. Multivariate analysis of the previous significant factors demonstrates that cesarean delivery, insufficient self-rated pre-pregnancy level of physical activity and absence of hypertension during pregnancy, increased body mass index are significant predictors of low to moderate overall physical activity with overall % predicted =95.7%, as shown in table 5.

DISCUSSION

There are scarce studies in Africa regarding exercise during pregnancy. Based on the information available, it appears that pregnant women in Africa do not follow the guidelines for Physical Activity (PA) throughout pregnancy as closely as their counterparts in the West. Pregnancy-related PA engagement is minimal and decreases during pregnancy. Most studies evaluated PA during pregnancy using direct, unbiased metrics.⁷ The current study demonstrated that; 95.6% of the

Table 5: Factors affecting low to moderate overall physical activity among pregnant females.

	Total n=386	Physical activity out of work		Univariate analysis		Multivariate analysis	
		High n=17	Low to moderate n=369	P value	COR (95% CI)	P value	AOR (95% CI)
Age/years							
18- (R)	216	5 (2.3)	211 (97.7)	0.002*	6.14 (1.93-19.50)	0.053	4.51 (0.98-20.71)
26-	107	4 (3.7)	103 (96.3)	0.037*	3.75 (1.08-12.99)	0.119	3.44 (0.73-16.12)
34+	63	8 (12.7)	55 (87.3)	0.005*	1		1
Occupation							
Housewife (R)	149	3 (2.0)	146 (98.0)	0.756	1.33 (0.218-8.16)		
Employee	162	12 (7.4)	150 (92.6)	0.168	0.342 (0.075-1.57)		
Manual worker	75	2 (2.7)	73 (97.3)	0.069	1		
Residence							
Rural (R)	196	6 (3.1)	190 (96.9)	0.199	1.95 (0.705-5.37)		
Urban	190	11 (5.8)	179 (94.2)		1		
Educational level							
Illiterate & Primary	87	1 (1.1)	86 (98.9)	0.054	7.67 (0.964-61.14)		
Middle education	177	6 (3.4)	171 (96.6)	0.078	2.55 (0.900-7.19)		
University and higher (R)	122	10 (8.2)	112 (91.8)	0.058	1		
Parity							
Nulli para (R)	130	6 (4.6)	124 (95.4)	0.998	1		
1-3	246	11 (4.5)	235 (95.5)	0.949	1.03 (0.373-2.86)		
>3	10	0	10 (100)	0.999	Undefined		
Gravidity							
Nulli gravida (R)	30	0	30 (100)	0.530	1		
1-3	298	16 (5.4)	282 (94.6)	0.998	Undefined		
>3	58	1 (1.7)	57 (98.3)	0.998	Undefined		
History of abortion							
No (R)	370	16 (4.3)	354 (95.7)	0.713	1		
Yes	16	1 (6.2)	15 (93.8)		0.678 (0.084-5.46)		
Mode of delivery at last pregnancy							
Vaginal (R)	65	8 (12.3)	57 (87.7)	0.001*	1	0.002*	1
Cesarean delivery	191	3 (1.6)	188 (98.4)		8.79 (2.25-34.25)		8.72 (2.18-34.81)
Smoking history							
Nonsmoker (R)	373	14 (3.8)	359 (96.2)	0.001*	7.69 (1.90-31.08)	0.999	Undefined
Smoker	13	3 (23.1)	10 (76.9)		1		
Self-rated pre-pregnancy level of physical activity							
Sufficient	161	15 (9.3)	146 (90.7)	<0.001*	1	0.001*	14.92 (3.17-70.27)
Insufficient (R)	225	2 (0.9)	223 (99.1)		11.45 (2.58-50.83)		
Gestational DM	50	1 (2.0)	49 (98.0)	0.375	2.45 (0.318-18.89)		
Gestational hypertension	29	4 (13.8)	25 (86.2)	0.01*	0.238 (0.07-0.782)	0.003*	0.131 (0.03-0.51)
Anemia	138	9 (6.5)	129 (93.5)	0.130	0.478 (0.180-1.27)		
Medical history of disease	63	3 (4.8)	60 (95.2)	0.880	0.906 (0.253-3.25)		
BMI (Mean ±SD)	386	27.12±3.16	29.32±3.52	0.012*	1.20 (1.04-1.39)	0.01*	1.22 (1.05-1.43)

COR: Crude odds ratio, AOR: Adjusted odds ratio, BMI, body mass index

.studied pregnant females have low to moderate physical activity. This was higher than the rate of physical inactivity detected by Nor et al., who ⁸ found that 38.3% of the studied pregnant females in Malaysia are physically inactive, this may be explained by the absence of cultural and educational awareness among Egyptian pregnant females of physical activity during pregnancy. This low level of physical activity was evident in other studies ⁹⁻¹² which were expected as pregnant women tend to reduce and limit their

physical activities during pregnancy and relate this with abortion or preterm labor.

In the present study, self-rated insufficient pre-pregnancy level of physical activity, higher body mass index, cesarean section as a mode of delivery during the last pregnancy, and presence of gestational hypertension were statistically significant determinants of low to moderate physical activity among pregnant females.

Similarly; Putri et al.¹³ have shown that one of the elements influencing physical activity during the present pregnancy is the maternal physical activity habits before pregnancy, also the study carried out by Nascimento et al.¹⁴ illustrated that; regular exercise before pregnancy is a statistically significant predictor of good physical activity during pregnancy (OR= 6.45; CI 95% 4.64–8.96) and also come in line with the study carried out by Rabiepoor et al.¹⁵ This could be explained by that females with regular physical activity before pregnancy are more oriented about the value of physical activity and that physical activity is part of their lifestyle that facilitates continuation during pregnancy.

In line with our study; Lindqvist et al. reported that females with a higher body mass index were more susceptible to be physical inactive.¹⁶ Santo et al.,¹⁷ found that those who were underweight were more expected to be physically active compared with normal BMI ones. However, in contrast to our study; Nor et al.,⁸ found that body mass index at booking was significantly associated with physical inactivity, those with lower BMI were more likely to be physically inactive. Two other studies did not report BMI to be significantly associated with physical activity levels.¹⁰⁻¹⁸ Further research is needed to investigate and discuss the discrepancies in findings related to BMI. The relation between obesity and low level of physical activity in the present study could be clarified by that; high body mass is more likely to be the result of an inactive lifestyle.

Meander et al.¹⁹ found a statistically significant relationship between cesarean section and physical inactivity that was in agreement with our results also other studies support the same findings.²⁰⁻²¹ This could be explained by the that the previous CS section is related to sedentary life and is more likely to be associated with obesity and low physical activity.²²

In contrast with our study, a higher incidence of pregnancy-induced hypertension and or pre-eclampsia was observed among females who reported higher sedentary life.¹⁹ However; two previous studies found no significant association²³⁻²⁵ this may be explained by that females with gestational hypertension are more liable to preterm labor and thus may be afraid of doing any physical activity. The results in our study may be explained by the number of females with gestational hypertension being only

7.5% of the sample which may not be sufficient to reveal this relationship.

Strength and limitations of the study: No previously published studies were carried out to assess physical activity degree among pregnant females in the third trimester with a large sample size. On the other hand, the study was a cross-sectional, hospital-based study that was carried out at one hospital only besides studying only pregnant females in the third trimester

CONCLUSIONS

The present study demonstrates that cesarean delivery, insufficient self-rated pre-pregnancy level of physical activity, absence of gestational hypertension, and increased body mass index can significantly predict low overall physical activity among pregnant females. The study findings underscore the importance of promotion of pre-pregnancy level of Physical activity. Health education programs should be directed to pregnant females of younger age and females who previously delivered by cesarean section.

Ethical consideration: A written consent was obtained from female participants participating in the study after assuring the privacy of data. The data collection and examination were done by the investigator. The study proposal was approved by the IRB committee with the following acceptance code R.22.11.1959.R1.

Recommendations

Promotion of pre-pregnancy level of Physical activity and Health education programs directed to pregnant females of younger age and females who previously delivered by cesarean section are mandatory.

Funding source: The authors received no financial support related to this research.

Conflict of interest: All authors have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgment: The authors would like to thank the pregnant females who participate in the study.

Availability of data and materials: The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

REFERENCES

1. WHO. Global health risks: mortality and burden of disease attributable to selected major risks. Geneva: World Health Organization; 2009.
2. Waxman A, World Health Assembly. WHO global strategy on diet, physical activity and health. *Food Nutr Bull* 22004004;25 (3):292-302.
3. Claesson IM, Klein S, Sydsjo G, Josefsson A. Physical activity and psychological well-being in obese pregnant and postpartum women attending a weight-gain restriction program. *Midwifery* 2014;30 (1):11-16.
4. Gaston A, Cramp A. Exercise during pregnancy: a review of patterns and determinants. *J Sci Med Sport* 2011;14 (4):299-305.
5. Okafor, U.B., Goon, D.T. Physical activity and exercise during pregnancy in Africa: a review of the literature. *BMC Pregnancy Childbirth* 20, 732 (2020). <https://doi.org/10.1186/s12884-020-03439-0>
6. Saglam M, Arikan H, Savci S, et al. International physical activity questionnaire: reliability and validity of the Turkish version. *Percept Mot Skills*, 2010, 111: 278-284.
7. Okafor UB, Goon DT. Physical activity and exercise during pregnancy in Africa: a review of the literature. *BMC Pregnancy and Childbirth*. 2020;20:1-17.
8. Poyatos-León R, García-Hermoso A, Sanabria-Martínez G, et al. Effects of exercise during pregnancy on mode of delivery: a meta-analysis. *Acta obstetrica et Gynecologica Scandinavica*. 2015;94 (10):1039-47.
9. Garland M. Physical activity during pregnancy: prescription for improved perinatal outcomes. *J Nurse Pract*. 2017;13 (1):54-8.
10. Nascimento SL, Surita FG, Godoy AC, Kasawara KT, Morais SS. Physical activity patterns and factors related to exercise during pregnancy: a cross-sectional study. *PLoS One*. 2015;10 (6):e0128953
11. Santos PC, Abreu S, Moreira C, Santos R, Ferreira M, Alves O, et al. Physical Activity Patterns During Pregnancy in a Sample of Portuguese Women: A Longitudinal Prospective Study. *Iran Red Crescent Med J*. 2016;18 (3):e22455-e.
12. Merckx A, Ausems M, Budé L, de Vries R, Nieuwenhuijze MJ. Weight gain in healthy pregnant women about pre-pregnancy BMI, diet, and physical activity. *Midwifery*. 2015;31 (7):693-701
13. Putri AK, Rosida L, Ummah F. Factors Affecting Physical Activity During Pregnancy: A Scoping Review. *Jurnal Midpro*. 2021;13 (2):263-72.
14. Nascimento SL, Surita FG, Godoy AC, et al. Physical activity patterns and factors related to exercise during pregnancy: a cross-sectional study. *PloS one*. 2015;10 (6):e0128953.
15. Rabiepoor S, Rezavand S, Yas A, et al. Influential factors in physical activity amongst pregnant women. *Balt J Health Phys Activ*. 2019;11 (2):36-45.
16. Lindqvist M, Lindkvist M, Eurenus E, et al. Leisure time physical activity among pregnant women and its associations with maternal characteristics and pregnancy outcomes. *Sexual & Reproductive Healthcare*. 2016;9:14-20.
17. Santo EC, Forbes PW, Oken E, Belfort MB. Determinants of physical activity frequency and provider advice during pregnancy. *BMC Pregnancy Childbirth*. 2017;17 (1):286.
18. Yong HY, Mohd Shariff Z, Mohd Yusof BN, Rejali Z, Bindels J, Tee YYS, et al. High physical activity and high sedentary behavior increased the risk of gestational diabetes mellitus among women with excessive gestational weight gain: a prospective study. *BMC Pregnancy Childbirth*. 2020;20 (1):597.
19. Meander L, Lindqvist M, Mogren I, Sandlund J, West CE, Domellöf M. Physical activity and sedentary time during pregnancy and associations with maternal and fetal health outcomes: an epidemiological study. *BMC Pregnancy Childbirth*. 2021 ,27;21 (1):166.
20. Owe KM, Nystad W, Stigum H, Vangen S, Bo K. Exercise during pregnancy and risk of cesarean delivery in nulliparous women: a large population-based cohort study. *Am J Obstet Gynecol*. 2016;215 (6):791.e791-13. 30.
21. Nielsen EN, Andersen PK, Hegaard HK, Juhl M. Mode of delivery according to leisure time physical activity before and during pregnancy: a multicenter cohort study of low-risk women. *J Pregnancy*. 2017;2017:6209605.
22. Nilsson C, Persson M, Lindkvist M, Petersson K, Mogren I. High weight gain during pregnancy increases the risk for emergency cesarean section - population-based data from the Swedish maternal health care register 2011-2012. *Sexual & Reproductive Healthcare*. 2017;11:47-52.
23. Davenport MH, Ruchat SM, Poitras VJ, Garcia AJ, Gray CE, Barrowman N, Skow RJ, Meah VL, Riske L, Sobierajski F, et al. Prenatal exercise for the prevention of gestational diabetes mellitus and hypertensive disorders of pregnancy: a systematic review and meta-analysis. *Br J Sports Med*. 2018; 52 (21):1367-75
24. Chasan-Taber L, Silveira M, Pekow P, Braun B, Manson JE, Solomon CG, Markenson G. Physical activity, sedentary behavior and risk of hypertensive disorders of pregnancy in Hispanic women. *Hypertens Pregnancy*. 2015; 34 (1):1-16.
25. Loprinzi PD, Fitzgerald EM, Woelke E, Cardinal BJ. Association of Physical Activity and Sedentary Behavior with biological markers among US pregnant women. *J Womens Health*. 2013;22 (11):953-8.

Cite this article as: Gomaa, H.M.M. et al., Physical Activity among Pregnant Women During the Last Trimester and Its Associated Factors. *Egyptian Journal of Community Medicine*, 2023;41(4):270-279. DOI: 10.21608/ejcm.2023.212784.1258