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“Impact of motherhood on Women's Physical Fitness”

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Abstract

This study investigates how nutrition impacts the physical fitness of women, specifically focusing on mothers with different numbers of children. It explores the dietary habits of women during various stages of motherhood and examines their correlation with physical fitness levels. The research emphasizes the significance of regular physical activity and a balanced diet in promoting overall well-being and to understand how the number of children influences women's nutrition intake, particularly in terms of protein, fat, carbohydrate, and energy consumption. Additionally, it assesses the physical fitness levels of women in different motherhood categories, taking into account heart rate and the Physical Fitness Index (PFI). The findings suggest that an increase in the number of children is associated with a decline in physical fitness levels among mothers. To improve physical fitness, especially for mothers with multiple children, interventions should focus on maintain a nutritious diet and incorporate regular physical activity. The study also highlights that women tend to consume higher levels of protein and fat than recommended, and these nutritional habits vary based on the number of children. Moreover, the study shows that heart rate and PFI scores differ among women with varying experiences of motherhood. Mothers with more children generally exhibit lower physical fitness levels, likely due to the increased demands and responsibilities of motherhood, the research underscores the importance of adopting a balanced diet and engaging in regular physical activity to enhance the physical fitness of women, particularly those with multiple children. Educating and supporting women in maintaining a healthy lifestyle during motherhood can contribute to their overall well-being and that of their families.

Keywords: Physical Fitness Index (PFI), nutrition, heart rate, motherhood, physical fitness.

1. Introduction:

Women often experience a decrease in physical activity levels during the transition to motherhood. This decline may be more pronounced among working mothers who face the challenge of balancing work and family responsibilities, causing exercise to become a lower priority compared to other pressing concerns.

Engaging in regular physical activity is crucial for promoting both physical and mental well-being. It contributes to enhancing overall health and fitness, managing a healthy weight, lowering the risk of chronic diseases, and supporting positive mental health. However, there exist significant disparities in women's levels of physical activity across different countries. Various barriers hinder women's participation in physical exercise, including family responsibilities, cultural or social beliefs, economic or employment status, level of education, and the number of children at home. While studies have identified links between a higher number of children and increased body mass index (BMI), heart rate, energy expenditure, physical fitness level, limited research has been conducted to explore the connection with body composition, despite the independent association of abdominal fat with cardiovascular and metabolic risks (**Bridger et al., 2019**).

Disparities have been noted in the dietary habits of individuals who are parents compared to those who are not parents (**Saito et al., 2018; Laroche et al., 2012**). For instance, research has shown that parents tend to consume higher amounts of saturated fat compared to non-parents (**Laroche et al., 2012**). Additionally, previous studies have shown that those with 4 or more children are more likely to be physically inactive (**Hardy et al., 2007**). It has been found that the diets of mothers in Asian cultures contain more saturated fat than non-parents (**Berge et al., 2011; Laroche et al., 2007; Laroche et al., 2012**) and an increased intake of sugar sweetened beverages and total energy (**Berge et al., 2011**). Differences between mothers and non-mothers in terms of diet quality have also been demonstrated, with changes to macronutrients and mineral intake, in particular protein, carbohydrates and sodium (**Saito et al., 2018**).

Physical activity has also been identified as being lower in parents compared to non-parents (**Berge et al., 2011; Pereira et al., 2007**). Some research has found that inactivity is associated with increased parity in women (**Shen et al., 2015**) whilst others have found that motherhood itself, is key in explaining reduced levels of physical activity (**Bellows et al., 2008**). Obstacles to sustaining physical activity, such as feelings of guilt, family obligations, inadequate support, scheduling limitations, and work commitments, have been recognized as factors contributing to the disparity in activity levels between parents and non-parents (**Mailey et al., 2014**).

The current study, titled 'impact of motherhood on women's physical fitness' aimed to examine the physical fitness levels of women in relation to the number of children they have at home. By keeping above-mentioned studied in mind, the study was undertaken under following

Objectives:

1. To study impact of nutrition intake on physical fitness of women.
2. To assess the impact of number of children on physical fitness of women.

2. REVIEW OF LITERATURE:

Prakruthi and Parkash (2013) conducted a study on nutritional status and dietary pattern of Indian rural women with reference to energy intake and energy expenditure. Dietary intake of women was determined with 24 hour recall method. Results showed that average protein intake was 57.3 ± 15.1 g/d, fat was 34.3 ± 21.4 g/d and energy 1944 ± 443 kcal by the rural women. The diets were adequate in energy and protein contents, however, fat was found to be much higher than recommended value.

Kamalaja and Deepika (2015) conducted an exploratory study on assessment of food and nutrient intake in female and sample comprised of 30 females. Results showed that among all the foods, consumption of fat (38 g) in rural women was higher than RDA.

Chen *et al.* (2016) conducted a study on maternal macronutrient intake, by 320 mothers. Result found that Indian mothers had a higher intake of carbohydrate than Chinese and Malay mothers, Chinese mothers had a higher mean energy intake than Malay and Indian mothers.

Sims *et al.* (2021) conducted an exploratory study on food insecurity and dietary intake by 42 rural Indian women. Energy, protein and fat were calculated and compared by the recommended value for the women. The findings indicate that, on average, women met 72.6 percent of the recommended energy intake, which corresponds to 5774.9 kilojoules (kJ) per day, below the recommended daily intake of 7950 kJ. Protein intake was (49.4g) which was lower than recommendations while fat intake (50.5g) and carbohydrate (223.3g) intakes were above the recommended value.

Kim *et al.* (2016) studied that walking time and heart rate. Women were walking three times per week with a duration of 60-120 minutes for 12 weeks and a heart rate (HR) of 50%-60% significantly caused changes in body composition.

Mahalakshmi *et al.* (2017) conducted an exploratory study on physical fitness of rural and urban women. Rural respondents (33.33%) belonged to high average and low average physical fitness level followed by good physical fitness level (26.67%) and poor (6.67%) physical fitness level. None of the respondents were in very good or excellent category of physical fitness Index.

Reimers *et al.* (2018) observed the effects of exercise on the resting heart rate on 215 women. Results revealed that under consideration of all comparisons, the RHR significantly decreased more in the exercising groups (intervention groups) compared to the control groups (yoga) (all studies: -4.7% and -3.3 bpm resp., females only: -4.8% and -3.4 bpm, resp).

Suryadinata *et al.* (2020) examined the effect of age and weight on physical activity. Results concluded that during the aging process, physical activity decreases by 40%-80% and caused the decrease in physical fitness.

3. Methodology:

1. Locale of the study

The present study was conducted in Haryana State. Fatehabad districts from Haryana state was selected randomly for the study. Further 2 village i.e boswal (block 9) and salam khera (block 4) randomly selected. So the study was carried out in two villages of Haryana state.

2. Sampling procedure

For present study women respondent were taken from the specific age group of 20-35 yrs and who were found to be having eldest child with age upto 10 yrs of age. Three categories were formulated viz. women having one child, two children and three children. Further the women's who were having no child were taken under control group. From each village 40 women 10 from each category were selected and thus the sample comprises a total of 80 women.

3 : Variables and their measurements (table 1.1)

Variables	Measurements
Nutrition intake by women	DietCal software
Heart rate	Heart rate monitor
Physical fitness	Step stool test

$$\text{Physical Fitness Index (PFI)} = \frac{\text{Duration of stepping (sec)}}{\text{Sum of 1st, 2nd \& 3rd min Recovery HR}} \times 100$$

4. Result and Discussion :

Data in Table 1.2 reflect nutrition intake by women under different categories. Regarding protein intake in diet women from control group (no child), women having one child, two children, three children were having average of $\bar{x}=53.48\pm 15.95\text{g/d}$, $\bar{x}=45.08\pm 7.23\text{g/d}$, $\bar{x}=49.35\pm 13.27\text{g/d}$ and $\bar{x}=53.95\pm 15.30\text{g/d}$, respectively protein intake in their diet. Overall women's were found to be taking $\bar{x}=51.96\pm 14.77\text{g/d}$ protein, which is 13.69 per cent higher protein than recommended value (i.e. 45.7g/d, ICMR 2020). Comparison of protein intake with recommended intake depict that women having three children were found to be taking 18.05 per cent high protein than recommended, followed by women's with no children were found to be taking 17.02 per cent high protein than recommended, and women's with two children were found to be taking 7.98 per cent high protein than recommended and women's with one child were found to be taking 1.35 per cent high protein than recommended. In Haryana, regarding eating pattern, rural women ensure the presence of milk and milk product, daal, paneer, and black/white gram, in the regular diet of family, ensuring that their children receive a nutritious diet and have a sufficient intake of protein, which simultaneously increasing the protein intake of rural women in their diet. Women from control group (no child), women having one child, two children, three children fat intake was $\bar{x}=25.04\pm 1.72\text{g/d}$, $\bar{x}=26.21\pm 1.61\text{g/d}$, $\bar{x}=25.35\pm 2.00\text{g/d}$ and $\bar{x}=26.41\pm 2.38\text{g/d}$, respectively. Regarding comparison of fat intake with recommended intake women having three children were found to be taking 5.64per cent high fat than recommended, followed by women's with one child were found to be taking 4.84per cent high fat than recommended, and women's with two children were found to be taking 1.4per cent high fat than recommended, women's with no child were found to be taking 0.16 per cent high fat than recommended. Average fat intake was found to be $\bar{x}=25.76\pm 1.99\text{g/d}$, there was 3.04 per cent increase of fat in diet with recommended (i.e. 25g/d, ICMR 2020). Women were found to be commonly using ghee in preparation to enhance the taste and flavour of food for making it, which was resulting in a slightly higher fat intake in their diet, in the study conducted by Kamalaja and Deepika (2015) similar results was found that among all the foods, consumption of fat (38 g) in rural women was higher than RDA. Women from control group (no child), women having one child, two children and three children carbohydrate intake was $\bar{x}=130.22\pm 5.70\text{g/d}$, $\bar{x}=129.65\pm 11.40\text{g/d}$, $\bar{x}=134.0\pm 10.74\text{g/d}$ and $\bar{x}=135.50\pm 13.79\text{g/d}$ respectively. Compared to recommended intake of carbohydrate women from control group (no child), having one child, two children and three children showed increase in intake of carbohydrate 0.16 per cent, 0.26 per cent, 3.07 per cent and 4.23 per cent, respectively. In their diet average intake of carbohydrate was $\bar{x}=133.02\pm 11.29\text{g/d}$, there was 2.32 per cent increase in carbohydrate intake with recommended intake (i.e. 130g/d, ICMR 2020). Women from control group (no child), having one child, two children, three children were taking energy intake of $\bar{x}=2134\pm 57.69\text{kcal}$, $\bar{x}=2138\pm 50.30\text{kcal}$,

$\bar{x}=2141\pm 41.34\text{kcal}$ and $\bar{x}=2132\pm 55.31\text{kcal}$, respectively. Results found in study by Ling-Wei Chen *et al.*(2016) revealed that Indian mothers had a higher intake of carbohydrate than Chinese and Malay mothers. Compared to recommended intake of energy women from control group (no child), women having one child, two children and three children showed increase in intake of energy 0.18 per cent, 0.37 per cent, 0.51 per cent and 0.65 per cent respectively. The overall energy intake of women's was found to be $\bar{x}=2132\pm 55.31\text{kcal}$, overall women's were found to be taking 0.09 per cent high energy than recommended (i.e. 2130 kcal, ICMR 2020). Prakruti and Parkash (2013) studied on nutritional status on rural women with reference to energy intake and expenditure, showed that energy intake by rural women was $\bar{x}=2029\pm 186$ which was higher than recommended

Table: 1.2 Nutrition intake by women as per stage of motherhood (N=80)

Nutrient	Recomm- ended (ICMR 2020)	Control group (no child) (n=20)	One child (n=20)	Two children (n=20)	Three children (n=20)	Total (N=80)
Protein	45.7 g/d	53.48±15.95	45.08±7.23	49.35±13.27	53.95±15.30	51.96±14.77
% change		17.02↑	1.35↓	7.98↑	18.05↑	13.69↑
Fat	25 g/d	25.04±1.72	26.21±1.61	25.35±2.00	26.41±2.38	25.76±1.99
% change		0.16↑	4.84↑	1.4↑	5.64↑	3.04↑
Carbohy- drate	130 g/d	130.22±5.70	129.65±11.40	134.0±10.74	135.50±13.79	133.02±11.29
% change		0.16↑	0.26↑	3.07↑	4.23↑	2.32↑
Energy	2130 kcal	2134±57.69	2138±50.30	2141±41.34	2144±53.59	2132±55.31
% change		0.18↑	0.37↑	0.51↑	0.65↑	0.09↑

Findings in Table 1.3 illustrate the category wise intake of nutrients as per stage of motherhood. More than half (55%) women were taking high level protein, followed by 25 per cent were taking medium level and 20 per cent were taking low level protein than the recommended value i.e. 45.7g/d, ICMR 2020. As per intake of fat most (52.50%) of women were taking low level of fat, followed by 25 per cent taking medium level fat, and 22.50 per cent taking high level fat than the recommended i.e. 25g/d, ICMR 2020. Regarding carbohydrate intake 42.50 per cent women were found to be taking low level of carbohydrate, followed by 40 per cent were taking high level carbohydrate than recommended value (i.e. 130g/d, ICMR 2020) and only 17.50 per cent were having medium level of carbohydrate in their diet. In case of energy intake 41.25 per cent women were taking diet having low level of energy (<2130kcal), followed by 38.75 per cent women's energy intake was found to intake high level of energy than recommended, and only 20 per cent women were having medium level of energy intake in their diet.

Table 1.3: Category wise nutrition intake as per stage of motherhood (N=80)

Balance diet	Control group(No Child) (N=20)	One Child (N=20)	Two children (N=20)	Three children (N=20)	TOTAL (N=80)
	f (%)	f (%)	f (%)	f (%)	f (%)
Protein (45.7g/d)					
Low (<45.7)	5(25.00)	10(50.00)	10(50.00)	5(25.00)	16(20.00)
Medium (45.7)	5(25.00)	5(25.00)	3(15.00)	4(20.00)	20(25.00)
High (>45.7)	10(50.00)	5(25.00)	7(35.00)	11(55.00)	44(55.00)
Fat (25g/d)					
Low (<25)	4(20.00)	8(40.00)	11(55.00)	8(40.00)	42(52.50)
Medium (25)	4(20.00)	6(30.00)	4(20.00)	4(20.00)	18(22.50)
High (>25)	12(60.00)	6(30.00)	5(25.00)	8(40.00)	20(25.00)
Carbohydrate (130 g/d)					
Low (<130)	4(20.00)	12(60.00)	6(30.00)	10(50.00)	34(42.50)
Medium(130)	7(35.00)	4(20.00)	4(20.00)	5(25.00)	14(17.50)
High (>130)	9(45.00)	4(20.00)	10(50.00)	5(25.00)	32(40.00)
Energy (2130 kcal)					
Low (<2130)	3(15.00)	12(60.00)	7(25.00)	10(50.00)	33(41.25)
Medium (2130)	4(20.00)	3(15.00)	3(15.00)	3(15.00)	16(20.00)
High (>2130)	13(65.00)	5(25.00)	10(50.00)	7(35.00)	31(38.75)

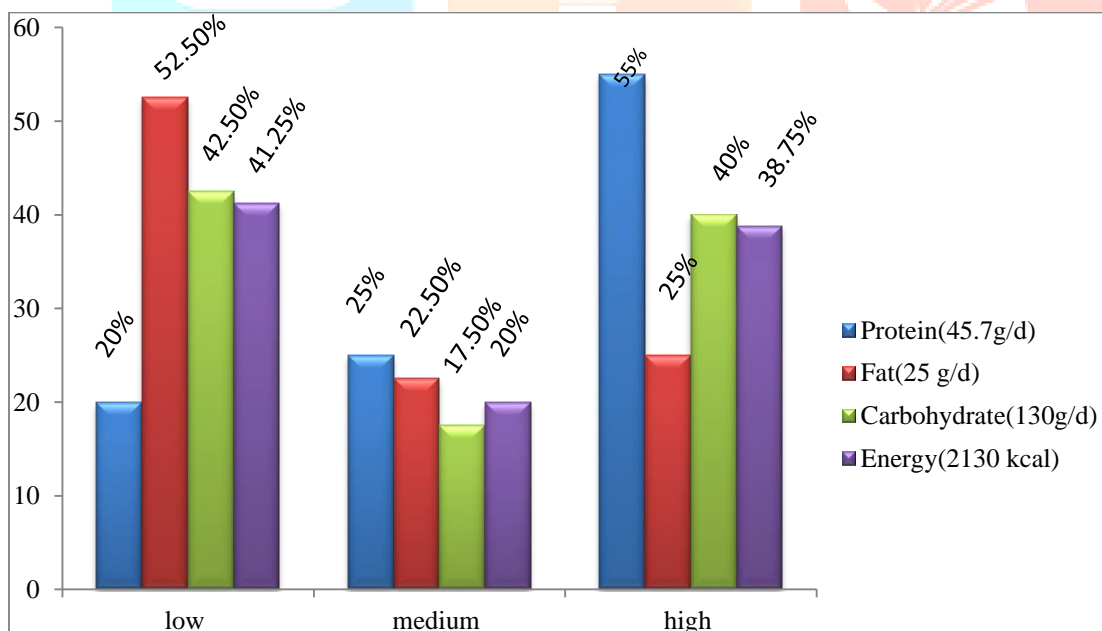


Fig. 1.1 category wise nutrition intake as per stage of motherhood

Results in Table 1.4 depicts that the heart rate of women in the control group (no children), women with one child, two children, and three children was $\bar{x}=79.05\pm 2.58$ bpm, $\bar{x}=82.9\pm 4.48$ bpm, $\bar{x}=84.45\pm 5.58$ bpm, and $\bar{x}=84.25\pm 5.61$ bpm, respectively. The average heart rate for all women was found to be $\bar{x}=82.1\pm 4.0$ bpm. A study conducted on the effects of exercise on the resting heart rate of women, was taken by Reimers *et al.* (2018) Results revealed that Under consideration of all comparisons, the RHR was found significantly decreased more in the exercising groups (intervention groups) compared to the control groups (yoga). The studies found a decrease of 4.7% and 3.3 beats per minute (bpm)

overall, while specifically for females, there was a decrease of 4.8% and 3.4 bpm, respectively. During exercise Heart rate of women from Control group (no child), women having One child, Two children, Three children was found $\bar{x}=102.30\pm 2.49$ bpm, $\bar{x}=105.45\pm 3.73$ bpm, $\bar{x}=108.40\pm 5.65$ bpm and $\bar{x}=110.95\pm 6.87$, respectively. Average heart rate during exercise of women's was $\bar{x}=114.3\pm 13.7$ bpm, followed by Recovery heart rate of women from Control group (no child), women having One child, Two children, Three children was found $\bar{x}=91.35\pm 2.81$ bpm, $\bar{x}=92.35\pm 4.05$ bpm, $\bar{x}=92.00\pm 6.47$ bpm and $\bar{x}=96.7\pm 5.84$ bpm, respectively. Average recovery heart rate of women's was $\bar{x}=92.08\pm 5.90$ bpm. Physical fitness index (PFI) of women from Control group (no child), women having One child, Two children, Three children was found $\bar{x}=109.67\pm 2.79$, $\bar{x}=106.98\pm 3.39$, $\bar{x}=105.49\pm 5.71$, $\bar{x}=103.03\pm 5.42$ respectively. Average PFI of women's was $\bar{x}=104.30\pm 6.68$.

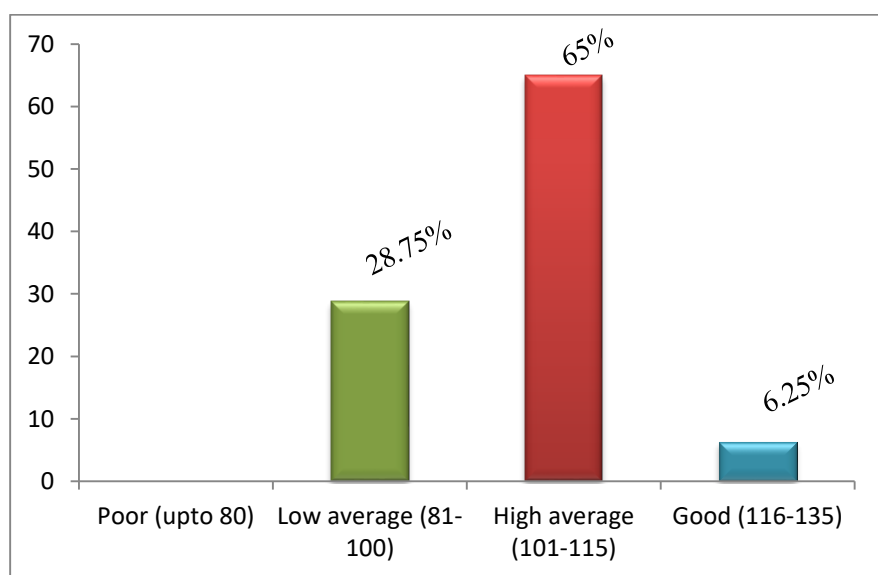
Table 1.4: Physical fitness index (PFI) of women as per stage of motherhood ((N=80)) :

S.no	Control group (No child) (mean ± std.) (n =20)	One child (mean ± std.) (n =20)	Two children (mean ± std.) (n = 20)	Three children (mean ± std.) (n = 20)	Total (mean ± std.) (N=80)
Heart Rate	79.05±2.58	82.9±4.48	84.45±5.58	84.25±5.61	82.1±4.05
During exercise	102.30±2.49	105.45±3.73	108.40±5.65	110.95±6.87	114.30±13.7
Recovery HR	91.35±2.81	92.35±4.05	92.00±6.47	96.70±5.84	92.08±5.90
PFI	109.67±2.79	106.98±3.39	105.49±5.71	103.03±5.42	104.30±6.68

The data presented in Table 1.5 reveals that a majority (75%) of women in the control group (no children) had a high average physical fitness score, while 25.00 per cent had a good physical fitness score. Among women with one child(15.00%), two children(20.00%), and three children(80.00%) had a low average physical fitness score. women with one child (85.00%),having two children (80.00%), and three children (20.00%) had a high average physical fitness score. Majority 65.00 per cent of women had average physical fitness score with 28.75 per cent had low average and 6.25 per cent had good physical fitness. The declining trend in PFI could be attributed to the increased physiological stress and demands associated with motherhood. Balancing childcare, household responsibilities, and work might leave less time for regular exercise and physical activity, leading to a slight decrease in overall physical fitness. A study conducted by Mahalakshmi (2017) on physical fitness of rural and urban women, revealed that rural respondents (33.33%) belonged to high average and low average physical fitness level followed by good physical fitness level (26.67%) and poor (6.67%) physical fitness level. None of the respondents were in very good or excellent category of physical fitness Index.

Table 1.5: Physical fitness index (PFI) score of women as per stage of motherhood (N=80) :

S.no.	Score	Control group (no child) (n=20)	One child (n=20)	Two children (n=20)	Three children (n=20)	Total (N=80)
Up to 80	Poor	-	-	-	-	-
81-100	Low average	-	3(15.00)	4(20.00)	16(80.00)	23(28.75)
101-115	High average	15(75.00)	17(85.00)	16(80.00)	4(20.00)	52(65.00)
116-135	Good	5(25.00)	-	-	-	5(6.25)

**Fig 1.2 Physical fitness index of women as per stage of motherhood**

Findings shown in Table 1.6, illustrate that the control group women had a low heart rate ($\bar{x}=79.05 \pm 2.58$) compared to women with one child ($\bar{x}=82.9 \pm 4.48$), two children ($\bar{x}=84.15 \pm 3.04$), and three children ($\bar{x}=82.3 \pm 4.28$), with a significant difference of 2.322. further in Women with three children had a low physical fitness index compared to women with two children, one child, and control group, with a significant difference of 2.659.

Table 1.6 Heart rate and physical fitness of women as per stage of motherhood (N=80)

Variables	Control group (no child) (n= 20)	One child (n= 20)	Two children (n= 20)	Three children (n= 20)	C.D
Heart rate	79.05 ^b ±2.58	82.9 ^a ±4.48	84.15 ^a ±3.04	82.3 ^a ±4.28	2.322
PFI	112.55 ^a ±3.67	104.14 ^b ±3.93	103.03 ^b ±3.03	97.87 ^c ±5.75	2.659

Results in Table 1.7 explained the correlation between nutrition intake and physical fitness index (PFI) of women. The correlation between protein and PFI in women of control group (no child) and those with one or two children indicating a positive and significant correlation ($p < 0.05$) because higher protein consumption is associated with a higher PFI, indicating a more balanced and nutritious diet, but for women with three children, the correlation was negative and not significant. Similarly, in women from control group ($r = -0.505$) there was a negative and significant correlation ($p < 0.05$) between fat and PFI because they intake less nutritious diet, But for women with one, two, or three children, the correlation was negative and not significant. When examining the correlation between carbohydrate and PFI, there was a positive and not significant correlation for women of control group, two children, and three children but for women with one child ($r = 0.529$), the correlation was positive and significant ($p < 0.05$) because inclusion of more whole grains and fruits, in their diet. Further the correlation between energy and PFI was negative and significant for women of control group ($r = -0.710$), as well as those with one child ($r = -0.669$), two children ($r = -0.673$), and three children ($r = -0.695$) because higher energy consumption is associated with a lower PFI, indicating that women with higher energy intake may have less balanced diets with potentially higher intake of unhealthy foods. Koehler *et al.*, 2019 studied on role of nutrition and physical activity for lifelong health, results found that healthy nutrition and physical activity (PA) were key lifestyle factors that modulate lifelong health through their ability to improve body composition, musculoskeletal health, and physical and cognitive performance, as well as to prevent metabolic diseases including obesity, diabetes mellitus, and cardiovascular disease across the lifespan.

Table 1.7: Correlation between nutrition intake and physical fitness index (PFI) of women (N=80) :

Variables	Control group (no child) (n=20)	One child (n=20)	Two children (n=20)	Three children (n=20)
Protein	0.580*	0.594*	0.523*	-0.175
Fat	-0.505*	-0.284	-0.286	-0.149
Carbohydrate	0.287	0.529*	0.066	0.075
Energy	-0.710*	-0.669*	-0.673*	-0.695*

* correlation significance at 0.05 level

5. Conclusion:

The study aimed to examine the nutrition intake and its correlation with physical fitness among women in different motherhood categories. It emphasizes the need for balanced and nutritious diets to maintain optimal physical fitness levels. Additionally, it underscores the significance of regular exercise and physical activity to complement a healthy diet and improve overall well-being. The number of pregnancies and childbirth experiences had a significant impact on a woman's physical fitness. As the number of children was increasing, the likelihood of multiple pregnancies and childbirths rises, this was negatively affecting physical fitness of mothers. To promote better physical fitness among women, especially those with multiple children, interventions should focus on providing education and support for maintaining a balanced and nutritious diet while incorporating regular physical activity into their daily routines. Empowering women with knowledge and resources can lead to improved overall health and well-being, benefiting both the women and their families.

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