RESEARCH ARTICLE

Assessing the Relationship Between Lifestyle Interventions and Pregnancy-Related Health Metrics

Irfan Suleheria[1] | Farooq bashir[2] | Hammad Tahir[3] | Fatima Muslim[4] | Hammad Ahmed[1] | Muhammad Azmat[1]

[1]Sialkot Institute of Science and Technology, Sialkot, Pakistan.

[2]Khaldunia Institute of Technology and Applied Sciences (KITAAS)

[3]Lahore University of Biological and Applied Sciences (UBAS)

[4]Minhaj University Lahore, Pakistan (MUL)

Abstract

Background: Pregnancy represents a period of profound physiological transformation, significantly increasing nutritional and metabolic demands. Within this context, suboptimal dietary intake and sedentary behavior emerge as critical, yet modifiable, risk factors. Scientific evidence consistently links these lifestyle elements to an elevated risk of adverse gestational outcomes such as gestational diabetes mellitus (GDM) and hypertensive disorders and suggests implications for the child's long-term health trajectory, a concept known as developmental origins of health and disease. **Objective:** This narrative review aims to critically analyze and integrate current evidence on the distinct and synergistic roles of dietary practices and structured physical activity in optimizing maternal-fetal health. It seeks to consolidate understanding of how these modifiable factors directly influence physiological adaptation, complication risk, and developmental programming. **Methods:** The analysis is conducted as a comprehensive narrative synthesis. We examine and integrate established physiological principles, contemporary clinical practice guidelines from leading health organizations, and current empirical research concerning prenatal nutrition and exercise physiology to present a coherent overview of evidence-based best practices. **Results:** The synthesized evidence robustly indicates that a balanced, nutrient-dense diet and regular, moderate-intensity physical activity are foundational for a healthy pregnancy. These practices work in concert to support appropriate maternal weight gain and cardiometabolic adaptation, thereby mitigating key risks for GDM and gestational hypertension. This risk reduction is directly associated with more favorable birth outcomes, including appropriate fetal growth patterns and reduced incidence of preterm delivery. Importantly, optimal prenatal nutrition and activity contribute to fetal metabolic and epigenetic programming, laying a foundation that reduces the offspring's future susceptibility to non-communicable diseases such as obesity, type 2 diabetes, and cardiovascular conditions. **Conclusion:** Proactive, evidence-based lifestyle management focusing on diet and exercise is not merely supportive but a fundamental component of contemporary prenatal care. Implementing structured education and support for these behaviors is essential for healthcare providers. This approach is crucial for safeguarding immediate maternal and neonatal health and represents a powerful strategy for promoting long-term intergenerational well-being, ultimately reducing the future burden of chronic disease.

***Corresponding Author:**
Irfan Suleheria
drirfansuleheriaone@gmail.com
Sialkot Institute of Science and Technology, Sialkot, Pakistan

1. Introduction

To satisfy the physiological needs of growing maternal tissues and blood volume as well as the growth and development of the foetus during the pregnancy, balanced nutrition is crucial. This will help prevent any preventable medical complications. The principles of antenatal standards of WHO provides 39 recommendations related to 5 types of interventions in the period of pregnancy. The healthy lifestyle and eating habits of pregnant women is promoted to prevent excessive gestational weight gain (GWG). During the period of pregnancy, the undernourished population, balanced energy and protein intake are recommended to avoid LBW[1].Regular exercise helps in improving health and fitness. National rules from the US Department of Health and Human services (HHS) and the American College of Midwifery and Gynecology suggests that pregnant females should exercise after consulting the health care provider. Bodily movements and workout are vital for good life. Exercise in pregnancy enables pregnant women to develop, preserve and reinstate extreme program and practical capability during their pregnancy[2].Research have also shown that expectant female's perception and boldness on the way to exercise in pregnancy is influenced greatly by tiredness, absence of initiation to work out, and insufficient previous knowledge on workout[3]. Expecting ladies who eat a reasonable eating regimen and follow daily physical activity, there are many investigations on substantial development during pre-birth period and the outcomes for the mother and new born. The guide lines for real action during pregnancy is extremely broad and isn't counted. The principal objective of this study is to overview the dietary practices and pattern of bodily movement activity movement of females during pregnancy. It will choose the impacts of these elements on the mother and neonatal child. Its third goal is to characterize the causes which impact the act of substantial development during this stage [4]. Exercise is a motivating technique for expectant women to handle their work's impact on their prosperity. Studies on exercise and expectant women's personal satisfaction have produced inconsistent results, nevertheless. Pregnancy is a critical phase in which the expecting lady need to adopt healthy routines so that evolution of her pregnancy shows to remain acceptable, as well as progress of the fetus. Such ways contain a well-adjusted diet with supplementation by certain nutrients, regular repetition of modest bodily activity permitting to the expectant woman's previous physical state, and terminating the use of alcohol, tobacco or other toxic substances. Females of child bearing stage are at a great danger of obesity as extreme weight may be increased throughout pregnancy and

reserved afterwards. So, adherence to references about the quantity of weight a lady must increase during pregnancy (by specific consideration to BMI grade) might inhibit chronic disease risks for a expecting mother and to new born. At present, there are no references on diet and bodily activity to guide health care workers in the management of obese expecting women. Fit obese expectant women have the aerobic ability to commence organized mobile actions, which gives provision to the feasibility of workout recommendation for this population cluster. By accepting the FITT opinion of exercise prescription, it is recommended that Obese expectant women whose a remedially prescreened for contraindications to workout can involve in bodily movement.

2. Rationale

This study explored the current dietary practices and the level of physical activity of the pregnant women of Sialkot. Appropriate diet and physical activity ensure good health and well-being during pregnancy especially in last trimester and affect the outcome of the pregnancy. Health diet and right type of physical activity could potentially reduce the incidence of pregnancy related complications including overweight, blood pressure, gestational diabetes, miscarriages etc. This study helped to know the actual dietary practices and physical activity level of the pregnant women and we can have assessed their health according to the outcome of the pregnancy.

3. Review of the Literature

(Pakistan Dietary Guidelines, 2019) during the period of pregnancy, the nutritional requirements of pregnant women depend on the pre-pregnancy nutritional status, poor nutritious status before conception leads to the higher nutrient requirements and weight gain in the period of pregnancy. High and low weight gains lead to complications in pregnancy. Embryonic and cell differentiation is taking place in first trimester with nominal weight gain, additional caloric intake is essential during the second trimester onwards to avoid unwanted weight gain and pregnancy related medical problems[1]. suggested that high quality food along with satisfactory macro and micro nutrient usage during pregnancy is essential for physical fitness of the mother and newborn. The developmental start of health and disease suggests that most medical complications in adulthood initiate in fetal years. At the moment, the application of this research in maximum countries are neither famous nor in practice. Whereas this

research is significant for normal food trends for a healthy lifestyle[2]. emphasized informative fertility of pregnant women is a prompting aspect in the real acquisition of motherly and child health for learning advantage teachings. The research explored that prenatal training is of extreme advantage to both the mother and fetus in order to decrease risks of diseases associated with pregnancy. The staging and the amount of risk fluctuations depends on the kind of risk, rate of the workout, exercise quality, time duration of exercise achieved during the prenatal period is very helpful to both mother and the new born[7]. Proposed that workout enhances the planned practice of physical workout specially for attaining facts of attainment or enhancing ability of workout and its outcome into an elastic diversity of biological. physical, bodily and sense of emotional variations and kind and level of mentioned oscillations axis on the sort of, constancy of physical workout. The power of workout, time duration of exercise because of prenatal phase role is beneficial for the fitness of the women[8]. suggested in his study that physical work has been rationally recognized for inspiring the flow of the blood circulation equally to the expecting women and the vibrant organ of the fetus. Physical activity enhances the tone strongly. So it is usual and safe delivery that is valuable for all the stages of the newly born and mother. The elements that affect the ultimate benefits consists of age, culture, belief, ignorance and kind of training may also affect consciousness of expecting mothers on the physical workout. Stage of expecting female typically stimulus her knowledge on the direction of the physical workout[9]. explored that physical workout planning for expecting women must comprise at least 5 minutes of training (sluggish, flat activities and stretch). A time period of sustained, enthusiastic aerophilic workout must last around five to fifteen minutes for cooling down, which contain slight movements for normalizing heartbeat. ACOG Committee on Obstetric Practice (2002) listed that physiologic and morphologic ups and downs of pregnancy may slow down after including few methods of physical movement. A woman's overall health, comprising obstetrical and health hazards, should be measured before starting a workout program. Mostly, contribution of an extensive variety of entertaining activities of work out seems to be helping during pregnancy, but every workout game should be studied individually for its potential risk, and actions with a high effect on stomach problem as it should be handled carefully during pregnancy.

Gaston and Cramp (2011) declared in their study that wide diversity of early motherly age shows adverse awareness

of facts of physical workout which shows that earlier woman contribute in high level of physical workout than older women. They also researched in the study that females under 24 years meet American College of Obstetricians and Gynecologist guideline more than pregnant women over 25 years of age because of dangers of other fitness problems. Suggested that diet class refers to the dietary adequacy and foodstuff variety of a person's nutritional intake and its arrangement with national dietary rules. Food quality suggests a wider view of nutrition and nutrient consumptions, as opposed to determine single nutrients or diet. The Australian Suggested Food Score (ARFS) is a previously validated tool that evaluates overall diet quality of adults. The ARFS has been amended for use in pregnancy before as a way to measure overall diet quality in this resident[6]. Suggested that diet education during pregnancy about healthy diet and fit routine during pregnancy can be the precise time to encourage satisfactory daily iron, folic acid ingestion, and other pregnancy exact foodstuffs[10].

Proposed that fundamental suggestions for a solid pregnancy were not being encountered by ladies in our antenatal help comparable to eating and actual work. Overweight ladies show up less inclined toward as such for certain however not all proposals. This is maybe not unexpected in that frame of mind of moderately unfortunate information and restricted medical services proficient evaluation or guidance. There are potential chances to further develop the medical care administrations pregnant ladies got to further develop information and ways of behaving connected with accomplishing a solid way of life, and to be sure it seems pregnant ladies need this[11]. Suggested that actual work and pregnancy writing has developed throughout recent years, and there is adequate experimental proof to help the advancement of moderate-to-incredible pre-birth active work for maternal medical advantages. Proposed that optional examination shows that the GeliS mediation was tolerably viable in further developing the antenatal Dad conduct in a normal consideration setting. As there was no distinction between bunches in the extent of ladies with extreme weight gain, a moderate change in Dad and dietary way of behaving alone probably won't be adequate to essentially affect generally GWG. Resulting investigations of the GeliS mother-kid companion could uncover the impact of antenatal Dad conduct on other maternal and posterity boundaries, with a unique spotlight on its drawn out influence on maternal and newborn child wellbeing.

Research Design and Methodology

Material and Methods

A cross-sectional study in which data was collected from pregnant women between ages 19-35 from second trimester till the end of their pregnancy form district Sialkot of Punjab Province of Pakistan with the help of research assistance from the respondent. The assessor instrument use in the collection of data for study was surveyed, which was tested on four hundred (400) pregnant women in Sialkot.

Study Design

A questionnaire, based on two parts i.e. a Food Frequency Questionnaire (Modified form of food frequency Questionnaire developed by KEM Hospital, Pune India) and a Physical Activity Level Assessment Questionnaire (Lisa Chasan Tabar et.al., Development and Validation of a Pregnancy physical activity) was used to collect the data from the pregnant women. The questionnaire were dispensed on the spot and answer of the questions were recorded face to face interview on the spot.

Study Population

In this study four hundred (400) pregnant women from Second trimester till the end of their pregnancy were assessed. The sample size was calculated according to the public health formula Open Epi from the selected population from Sialkot. The total population of Sialkot is six million. The pregnant women population is two million. The pregnant women sample in this study was calculated by this formula, which is between 19 years age to 35 years.

Sampling Technique

Purposive sampling was used to select the pregnant women for this study from Sialkot. It took three to four months to take the sample from the selected population.

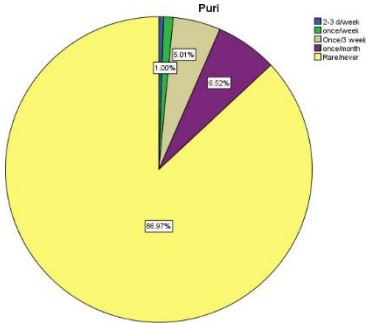
Inclusion Criteria

Pregnant women between ages 19-35, from second trimester till the end of their pregnancy, were included from Sialkot.

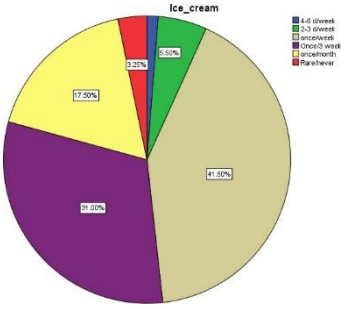
Exclusion Criteria

Only those pregnant women were included who have a normal progression of pregnancy. Women in their first trimester and those with existing medical problems, including diabetes, hypertension, heart disease and any other disease were excluded from the study.

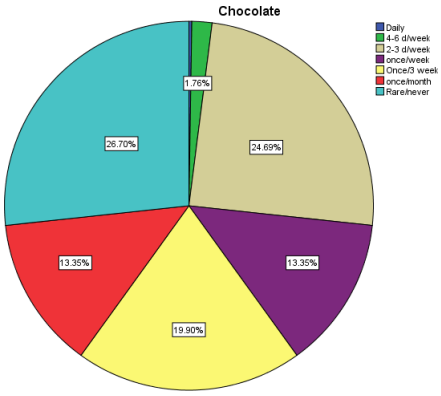
Results and Discussions



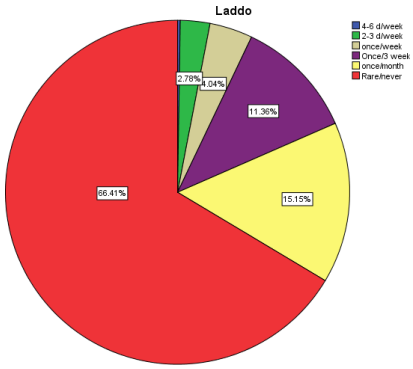
The pie chart shows that (1%)s were eating puri 2-3 d/week and (86.97%) did not or rarely eating samosa.



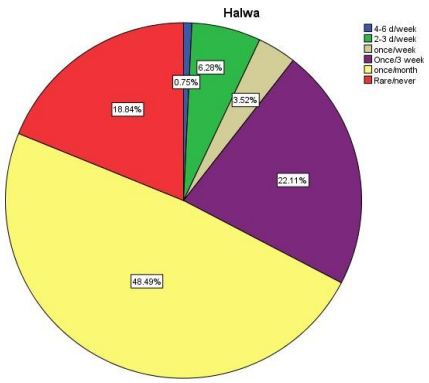
The pie chart shows that (3.25%) we're eating ice cream 4-6 d/week and (41.50%) were eating ice



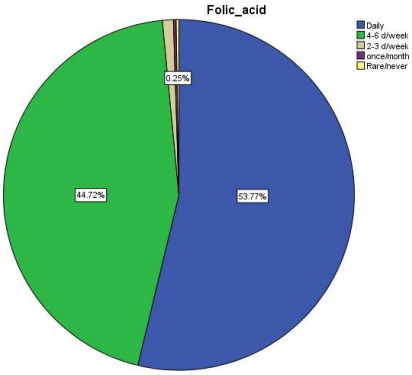
The pie chart shows that (176%) were eating chocolate daily and (26.70%) did not or rarely eating ice cream.



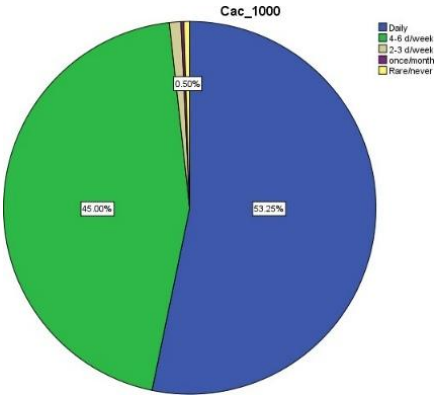
The pie chart shows that (176%) were eating chocolate daily and (26.70%) did not or rarely eating ice cream.



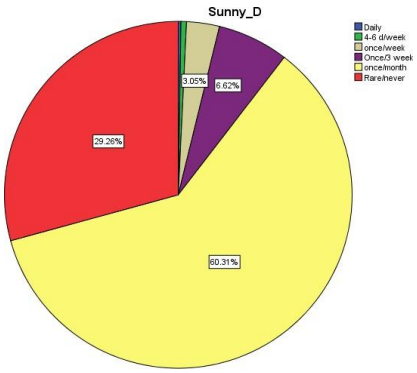
The pie chart shows that (0.75%) were eating halwa 4-6 d/week and (48.49%) halwa once a month.



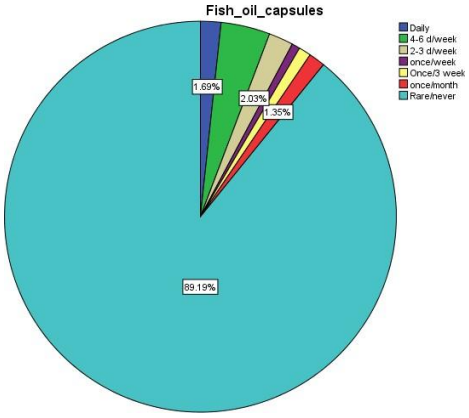
The pie chart shows that (53.77%) were eating folic acid daily and (.25%) were eating folic acid once a month.



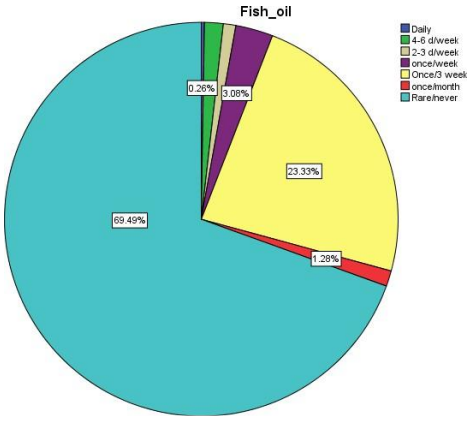
The pie chart shows that (53.25%) were eating Cac 1000 daily and (0.50%) were eating Cac 1000 once a month.



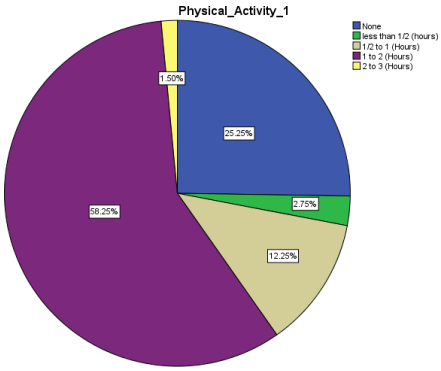
The pie chart shows that (.3%) were eating Sunny D daily, and (60.31%) were eating Sunny D once a month.



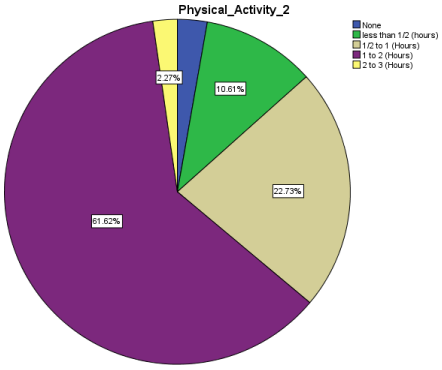
The pie chart that (1.36%) were eating fish oil capsules once/week and (89.19%) did not or rarely eating fish oil capsules.



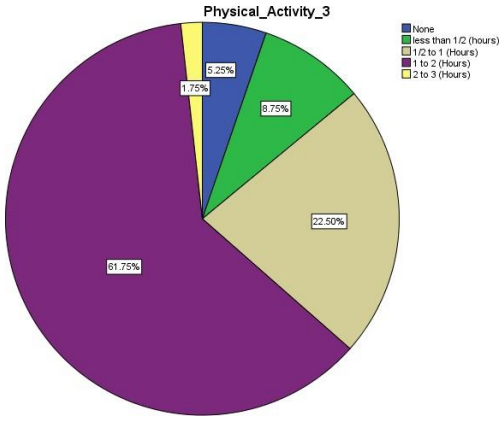
The pie chart that (1.36%) were eating fish oil capsules once/week and (89.19%) did not or rarely eating fish oil capsules.



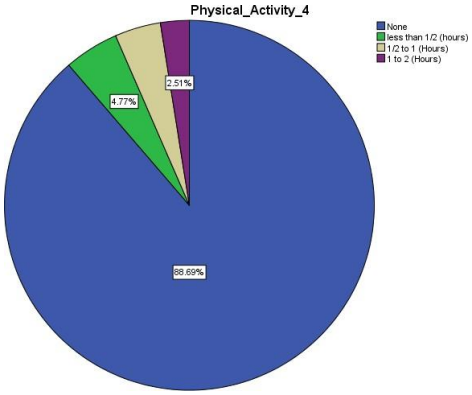
The pie chart shows that (58.25%) of the respondents were maximum who did not took ca of an older adult 1 to 2 hours and (1.50%)



The pie chart shows that maximum (61.62%) of the respondents prepareThe pie chart shows that maximum (61.62%) of the respondents prepared meals minimum (2.27%) of the respondents prepared meals (cook, set table, wash dishes) adult 2 to 3 hours.



The pie chart that maximum (61.75%) of the respondents dresses, bath and feed children while sitting 1 to 2 hours and minimum (1.75%) did not dress, bath and feed children while sitting 1 to 2



The pie chart that maximum (88.69%) did not dress, bath and feed children while standing and minimum (2.5%) did dress, bath and feed children while standing

1 to 2 hours

Correlations

		Health Status	Physical Activities
		1.000	**.590**
Correlation Coefficient			
Health Status	**Sig.(2-tailed)**		**.000**
	N	400	**400**
	Correlation Coefficient	.590	**1.000**
Physical Activities	**Sig.(2-tailed)**	.000	
	N	**400**	**400**

**. Correlation is significant at the 0.01 level (2-tailed).

The above table gives the correlation between health status of women and their physical activities. According to above table the Correlation coefficient is; 0.590 which means that there is good positive correlation between health status of women and their physical activities.

Association between Health status and Pregnancy Outcome

		Pregnancy outcome		Total
		Normal	Caesarean	
	Blood Pressure	5	95	**100**
	Gestational Diabetes	8	92	**100**
	Health Status Miscarriages	5	35	**40**
	Infection	5	55	**60**
	Preeclampsia	10	90	**100**
Total		**33**	**367**	**400**

Discussion

Poor nutritional status during pregnancy was associated with hemorrhage at delivery, prolonged labor, and LBW infants. A person's risk of under nutrition may also be increased by preexisting medical conditions, cultural restrictions on food availability, or both. Even if a mother is not going hungry, the developed fetus may not be able

to get the right nutrients from a host who is nutritionally compromised, which will limit growth. Because weight is usually easily and consistently measured, nutrition during pregnancy is frequently equated with weight gain. However, the increased nutrient requirements to support adequate fetal growth outweigh the limited additional energy requirements, and maternal weight gain is not always indicative of health outcomes, particularly for heavier women. For the metabolic demands of pregnancy and fetal growth, more energy is needed throughout pregnancy. Pregnancy causes an average 15% increase in metabolism, while there is significant variation, especially in the third trimester. Only 340 kcal per day and 452 kcal per day, respectively, are added to the DRI for energy during the second and third trimesters, respectively. Given individual variances in energy production and basal metabolic rate, the range of permissible calorie consumption varies greatly when maternal weight is within the desired limits. It is more useful to adjust intakes to achieve the recommended weight increase than to determine calorie needs. To sustain the synthesis of maternal and fetal tissues, more protein is needed. Throughout the entire pregnancy, this demand rises, reaching its peak in the third trimester. In the first half of pregnancy, pregnant women receive the same amount of protein as non-pregnant women 0.8 g/kg of current body weight/day. In the second half, needs rise to 1.1 gm/kg/day. The RDA for carbs rises somewhat, assisting in maintaining healthy blood glucose levels and avoiding ketosis. Although intake may be higher in women who consume more calories, careful carbohydrate choices are necessary to ensure that a pregnant woman gets all the daily nutrients she needs. Complex carbs from whole grains, fruits, and vegetables should be prioritized over simple sugars, especially refined liquid sugars, whether they are naturally occurring (in juices) or artificially generated (soda). consumption of whole-grain breads and cereals per day to add more minerals, vitamins, and fiber to your diet, eat more leafy green and yellow vegetables as well as fresh and dried fruits. 14 g/day/1000 kcal is the DRI for fiber during pregnancy. Physical activity level of the pregnant ladies was not enough up to the level of required status. Most of the females adopted sedentary life during pregnancy. Very few ladies were involved in physical activity. The duration of physical activity was 30 minutes to 45 minutes. It also depends on the education level of the female. Females who were less educated usually adopt sedentary life style. It also depends on the social norm because in our society it is usually believed that pregnant lady does not need to any kind of physical activity. Working ladies were doing physical

activity but their number was not significant.

Conclusions

This study characterized a cohort of 400 pregnant women in their second trimester, aged 18-35 years, with varied anthropometrics (weight: 48-100 kg; height: 4'10" to 6'). The participants, recruited from outpatient departments across ten hospitals in Sialkot, represented diverse socioeconomic and lifestyle backgrounds. Educational attainment ranged from matriculation to master's degrees, and family structures included both nuclear (68) and joint (332) systems, with the majority (375) having domestic help. Most participants were housewives (291), while 106 were employed. Lifestyle analysis revealed moderate, structured exercise durations (15-45 minutes). Physical activity was predominantly derived from domestic and caregiving tasks rather than leisure or play. A significant portion of time was spent on meal preparation, childcare while seated, and carrying children, while activities like playing with children or pets were largely unreported. Dietary patterns showed specific frequencies for various food groups. Lentil consumption varied by type (e.g., Moong eaten 4-6 days/week by 169 women), while egg intake was most common in boiled form (4-6 days/week for 133 women). Consumption of tubers (primarily potatoes once a week), fruits (notably bananas 2-3 days/week), and other items followed distinct, quantifiable patterns. This profile establishes a clear association between the participants' sociodemographic context and their specific workout and dietary habits during pregnancy.

References

1. Danielewicz, H., et al., *Diet in pregnancy—more than food.* European journal of pediatrics, 2017. **176**(12): p. 1573-1579.
2. Clapp III, J.F., *Exercise during pregnancy: a clinical update.* Clinics in sports medicine, 2000. **19**(2): p. 273-286.
3. Cioffi, J., et al., *Physical activity in pregnancy: women's perceptions, practices, and influencing factors.* Journal of midwifery & women's health, 2010. **55**(5): p. 455-461.
4. Muñóz, A.M., et al., *Nutritional habits and levels of physical activity during pregnancy, birth and the postpartum period of women in Toledo (Spain): study protocol for a two-year prospective cohort study (the PrePaN study).* BMJ open, 2019. **9**(7): p. e029487.
5. Parveen, A., et al., *Silicon priming regulates morpho-physiological growth and oxidative metabolism in maize under drought stress.* Plants, 2019. **8**(10): p. 431.
6. Gresham, E., et al., *Diet quality before or during pregnancy and the relationship with pregnancy and birth outcomes: the Australian Longitudinal Study on Women's Health.* Public health nutrition, 2016. **19**(16): p. 2975-2983.
7. Udoh, J., K. Cardwell, and T. Ikotun, *Storage structures and aflatoxin content of maize in five agroecological zones of Nigeria.* Journal of Stored Products Research, 2000. **36**(2): p. 187-201.
8. Mothapo, E.K., S.M. Maputle, and H.N. Shilubane, *Self-perceived competence of student midwives on plotting of partogram in labour units of Limpopo Province, South Africa.* 2014.
9. Elom, J.O.O.N.A., et al., *Perceived Benefits of Prenatal Exercise Among Pregnant Women Attending Antenatal Clinic at Federal Teaching Hospital, Abakaliki, Nigeria.* health, 2016. **6**(22).
10. Ashenafi Zelalem, A.Z., et al., *Effect of nutrition education on pregnancy specific nutrition knowledge and healthy dietary practice among pregnant women in Addis Ababa.* 2017.
11. Hill, B., et al., *Lifestyle intervention to prevent obesity during pregnancy: Implications and recommendations for research and implementation.* Midwifery, 2017. **49**: p. 13-18.
12. Downs, D.S., et al., *Physical activity and pregnancy: past and present evidence and future recommendations.* Research quarterly for exercise and sport, 2012. **83**(4): p. 485-502.
13. Agha, R., et al., *STROCSS 2019 Guideline: strengthening the reporting of cohort studies in surgery.* International journal of surgery, 2019. **72**: p. 156-165.
14. Downs, C., et al., *Validation of global EUV wave MHD simulations and observational techniques.* The Astrophysical Journal, 2021. **911**(2): p. 118.