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Association of Physical Activity With Perceived Stress and Well-Being in the Third Trimester of Pregnancy

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ABSTRACT

Physical inactivity is considered a worldwide pandemic that leads to numerous health problems. The World Health Organization advises pregnant women to participate in at least 150 minutes of moderate exercise each week to enhance health outcomes. As in the last trimester of pregnancy, considerable physical, hormonal, and psychological changes at this stage need further exploration. **Objectives:** To determine the association between physical activity, perceived stress, and well-being in the third trimester of pregnancy. **Methods:** A cross-sectional study of 245 third-trimester pregnant mothers was conducted at a local healthcare center using non-probability purposive sampling from June 2024 to November 2024. The Pregnancy Physical Activity Questionnaire (PPAQ) was used to quantify physical activity, stress levels were measured with the Perceived Stress Scale-04 (PSS-04), and well-being was assessed using the WHO-5 Well-Being Index. Spearman correlation analysis and descriptive statistics were used to investigate the connections among stress, physical activity, and well-being. **Results:** Increased physical activity is associated with decreased levels of stress, based on the data, It demonstrated a strong inverse relationship between physical activity and perceived stress (ρ=-0.342, $p<0.01$). Additionally, there was a positive correlation between well-being and physical exercise (ρ=0.232, $p<0.01$). **Conclusions:** It was concluded that physical activity decreased stress and improved well-being in the third trimester of pregnant women. This implies that medical professionals should recommend physical activities in prenatal care, especially in various cultural needs programs. More research is needed with larger, diverse groups.

INTRODUCTION

Physical inactivity has become a global public health issue, with over 80% of adolescents and 31% of adults not reaching the World Health Organization's (WHO) recommended levels of physical activity. Recently, physical inactivity has been recognized as the fourth leading contributor to premature deaths worldwide, escalating to pandemic proportions [1, 2]. This widespread inactivity has been linked to several chronic health problems, such as obesity, diabetes, and cardiovascular diseases, as well as a rise in psychological disorders, such as depression, anxiety, and stress [3]. One effective way to prevent these chronic diseases is by increasing physical activity. Encouraging active lifestyles addresses the root causes of many emerging chronic conditions. This strategy supports "more active people for a healthier world" as outlined in the WHO's Global Action Plan on Physical Activity (2018-2030) [4]. In recent times, most developed nations have changed their policies toward maternal care and the prevention of ailments rather than treatment. In this regard, the approach is to catch the illness before it develops; likewise, in pregnancy, everything is related to the mom and the kid. Furthermore, early development of health behaviour will help reduce a specific chronic disease [7]. Pregnancy, especially during the third trimester, is a transformative period marked by significant physical, emotional, psychological, and hormonal changes as the body prepares

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for childbirth. Hormonal fluctuations during this stage can affect mood, energy levels, and overall well-being. These changes, coupled with physical discomfort and concerns about childbirth, can lead to heightened stress and anxiety. These factors highlight the importance of understanding and addressing the unique needs of pregnant women during this critical phase [6]. Mental well-being during pregnancy is important because high levels of stress are known to affect not just the mother but also her unborn child. Pregnancy stress affects not only the emotional and physical health of the pregnant mother but also the growth and development of the unborn baby, contributing to low birth weight, preterm delivery, and developmental delays. It is, therefore, very important to ensure that mental health is considered during pregnancy for the well-being of both mother and child [7, 8]. Studies suggest that regular physical activity can play a significant role in preventing prenatal depression by improving mood and alleviating stress [9]. To improve health outcomes, the WHO advises pregnant mothers to engage in at least 150 minutes of moderate exercise each week [10]. However, approximately one in five pregnant women continue to experience suicidal thoughts, primarily due to untreated or severe depression, underscoring the need for effective interventions to address mental health challenges during pregnancy [11]. While global research supports the benefits of physical activity in stimulating the release of mood-enhancing hormones like serotonin [12], studies focusing on its impact during the third trimester when hormonal changes are most pronounced are limited, particularly in Pakistan. This gap in research highlights the importance of investigating the relationship of physical activity with perceived stress, also well-being during this critical period in Pakistan's unique cultural context. This research aims to create a healthier population by promoting increased physical activity, ultimately reducing the global burden of chronic diseases. Public health initiatives that encourage regular exercise strive to lower the rates of conditions like diabetes, heart disease, and obesity, thereby improving overall quality of life and reducing healthcare costs worldwide [13]. These efforts also support achieving Sustainable Development Goal 3 (SDG 3), which aims to promote well-being and healthy lives [14]. The findings from this study aim to provide valuable insights for healthcare organizations and policymakers in Pakistan, enabling them to develop strategies that integrate physical activity promotion into prenatal care programs. This research contributes to global efforts to address health disparities, improve maternal health outcomes, and foster healthier, more active populations, ultimately supporting sustainable development and a better quality of life. Physical inactivity is a global issue linked to poor health outcomes [15]. The WHO recommends 150 minutes of moderate exercise weekly [10], but cultural norms in Pakistan often discourage activity during pregnancy [16]. Addressing this gap can improve health outcomes and align with global health goals like SDG 3.

Physical inactivity has emerged as a global public health crisis, and its consequences are particularly pronounced during pregnancy, where the third trimester is characterized by profound physical, hormonal, and psychological changes that heighten vulnerability to stress, depression, and diminished well-being. Despite WHO recommendations for at least 150 minutes of moderate weekly exercise during pregnancy, cultural norms in Pakistan frequently discourage physical activity among pregnant women, yet research examining the specific relationship between physical activity, perceived stress, and well-being during the third trimester remains severely limited in the Pakistani context. This study therefore aimed to assess physical activity levels among third-trimester pregnant women and investigate their associations with perceived stress and overall well-being, generating locally relevant evidence to guide the integration of culturally sensitive physical activity promotion into prenatal care programs in Pakistan.

METHODS

An analytical cross-sectional study was conducted at the Gynecology and Obstetrics Outpatient Department (OPD) of Liaquat University Hospital, Hyderabad, to explore the association of physical activity with stress and well-being in the third trimester of pregnancy. The study was conducted over six months, from June 2024 to November 2024, after obtaining approval from the Ethical Review Committee (ERC) of Liaquat University of Medical and Health Sciences(LUMHS)(Approval number: LUMHS/REC/-303). A sample size of 245 was calculated using OpenEpi (prevalence: 17.6%, confidence level: 95%, margin of error: 5%), with an additional 10% included to account for non-responses or dropouts. Pregnant women in their third trimester were selected using non-probability purposive sampling. Participants included women aged 18–35 years attending the Gynecology OPD who provided informed consent and were free from severe medical or obstetric complications affecting physical activity, stress, or well-being. Women were excluded if they did not consent, were advised against physical activity for medical reasons, had physical disabilities, or were on psychological medications. Data were collected using structured questionnaires, which were freely available, validated, and reliable. Minor modifications were made to adapt to the local context, and experts reviewed the validation of these modifications. The demographic details section collected participant information, including age, residence, education, and other

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pertinent variables. The Pregnancy Physical Activity Questionnaire (PPAQ) assessed daily physical activity, with higher scores indicating greater activity levels. This tool has shown strong reliability, with a Cronbach's alpha greater than 0.7. The Perceived Stress Scale (PSS-04) evaluated stress levels using four items rated on a 0–4 Likert scale, where higher scores correspond to increased stress. This scale also shows good reliability (Cronbach's alpha >0.7). The WHO-5 Well-Being Index also measured overall well-being through five items rated on a 0–5 scale, with higher scores reflecting better well-being. This index has a high reliability level, with a Cronbach's alpha of more than 0.8. To analyze the data, SPSS version 22.0 was used. Descriptive statistics, such as percentages and frequencies, were computed for categorical variables. Correlation analysis between physical activity, stress, and well-being was conducted using the Pearson correlation test, with confidence intervals added for comprehensive reporting. At a 95% confidence level, a p-value of less than 0.05 was deemed statistically significant. Ethical considerations included obtaining written informed consent, ensuring participant confidentiality, and adhering to ERC guidelines.

RESULTS

A total of 245 women in their third trimester participated in the study. The sample's demographic characteristics offer a meaningful context for understanding the study findings. The average age of the participants was 25.05 ± 4.60 years, with an age range extending from 18 to 35 years. Most of the participants were between the ages of 18 and 30 years, which is reflective of the typical reproductive age range in this population. This data suggests that most participants were Urdu-speaking (76.3%), followed by Sindhi (20.0%) and others (3.7%). Additionally, 48.2% of participants had education above the secondary level, while 29.4% had no formal education. These demographics may have influenced the findings, which are interrelated with physical activity, well-being, and stress during pregnancy (Table 1).

Table 1: Sociodemographic Characteristics of Participants

Variable	Categories	Frequency (%)
Age group (Years)	18-25	146 (59.6)
	26-30	78 (31.8)
	31-35	21 (8.6)
Ethnicity	Urdu	187 (76.3)
	Sindhi	49 (20.0)
	Other (Saraiki, Punjabi)	9 (3.7)
Education Level	None	72 (29.4)
	Primary	55 (22.4)
	Secondary and Above	118 (48.2)

The analysis of physical activity levels among participants revealed that most engaged in light physical activity, contributing 69% (9,767 METs), followed by moderate activity at 20% (2,806 METs). Sedentary behaviour accounted for 11% (1,564 METs), with no participants reporting vigorous physical activity. These findings underscore a preference for low-intensity activities during pregnancy, highlighting the need for interventions to encourage moderate-intensity activities for better maternal health outcomes (Figure 1).

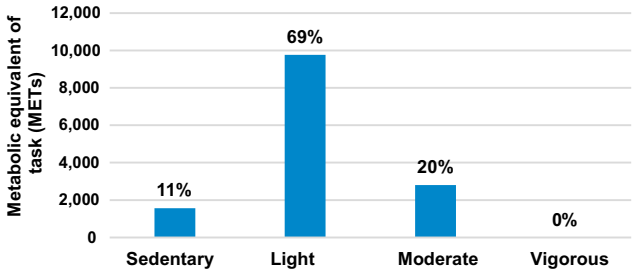

Figure 1: Cumulative Physical Activity Distribution Across Participants

Stress levels were assessed among participants, revealing that 63.7% experienced normal stress levels, while 36.3% exhibited elevated stress levels. This finding emphasizes the need for targeted interventions to alleviate stress, especially during the third trimester when pregnancy's physical and emotional demands peak (Figure 2).

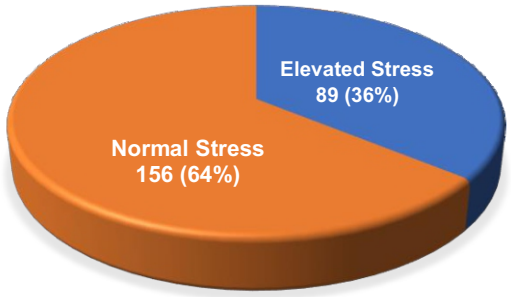

Figure 2: Distribution of Stress Levels Among Participants

Mental well-being analysis indicated that 21.2% of pregnant women experienced depression, 31.8% reported poor well-being, and 46.9% had better well-being. These results underscore the mental health challenges prevalent during pregnancy, particularly in the third trimester, highlighting the need for focused interventions (Figure 3).

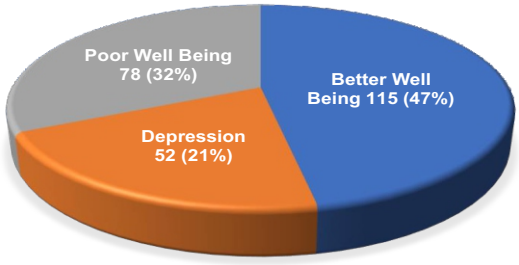

Figure 3: Distribution of mental well-being Levels Among Participants

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Spearman's correlation analysis revealed a negative and moderate relation between perceived stress with physical activity engagement (r=-0.342, p<0.01), which means high physical activity levels are associated with lower perceived stress(Table 2).

Table 2: Spearman's Correlation Analysis Between Physical Activity and Perceived Stress

Variable	Physical Activity	Perceived Stress
Physical Activity	1.000	-0.342 (p<0.01)
Perceived Stress	-0.342 (p<0.01)	1.000

Similarly, a weak but significant positive correlation was found between physical activity and well-being (r=0.232, p<0.01). This indicates that increased physical activity is mildly associated with improved well-being(Table 3).

Table 3: Spearman's Correlation Analysis Between Physical Activity and Well-Being

Variable	Physical Activity	Well-Being
Physical Activity	1.000	0.232 (p<0.01)
Well-Being	0.232 (p<0.01)	1.000

DISCUSSION

The sample's demographic characteristics offer a meaningful context for understanding the study findings. The average age of the mothers was 25.05 ± 4.60 years, with the age range extending from 18 to 35 years as shown in Table 1. reflecting the typical reproductive age range. Younger participants, generally more active than older women, may have influenced physical activity and psychological health findings. The relatively young age of the participants is important to note as it may influence both physical activity and psychological health, given that younger women generally engage in more physical activity than older women [17]. This demographic information helps contextualize the physical activity behaviours observed in the study. In this study, the majority of physical activity was light, accounting for 69% of the total activity. Moderate physical activity constituted 20%, while sedentary activity made up 11%. Notably, no participants reported engaging in vigorous physical activity. This distribution aligns with previous research, which shows that Pregnant women mostly engaged in light to moderate-intensity physical activities [18]. This study found no evidence of vigorous physical activity during the third trimester. Similarly, a North Carolina study on pregnant women reported that vigorous activity was uncommon during pregnancy [19]. Results showed that 63.7% of participants had normal stress, while 36.3% experienced elevated levels. Elevated stress during pregnancy is linked to risks like preterm births and low birth weights. Elements like hormonal changes, social support, and discomfort can increase stress, consistent with findings from previous studies [20]. Well-being was measured using the WHO-5 index. A score above 50 indicated better well-being, 50 or below indicated poor well-being, and below 28 signified depression. The total score, scaled to 100, was calculated by multiplying the raw score by 4, as defined in previous studies [21]. 21.2% of pregnant women experienced depression, while 31.8% reported poor well-being, indicating common mental health challenges during the third trimester. However, 46.9% maintained better well-being, highlighting resilience in many mothers. These findings align with WHO reports that nearly 1 in 5 women, or 20%, face mental health issues during pregnancy or postpartum, including suicidal thoughts or self-harm. Neglecting maternal mental health can negatively impact both the mother's and the infant's development [22]. The results underline the connection between perceived stress and physical activity, indicating that some lower stress levels while pregnant may be a result of increased physical activity. The Spearman correlation analysis supports this observation, showing a moderate negative relationship between perceived stress and physical activity (r=-0.342, p<0.01), showing that being more active is linked to lower levels of perceived stress, these results align with existing evidence emphasizing the stress-reducing benefits of physical activity, Being more active is known to stimulate the release of endorphins, which can improve mood and reduce stress hormones like cortisol [23]. Additionally, The Spearman correlation analysis reveals a significant positive relationship between physical activity and well-being (r=0.232, p<0.01. Although the correlation is weak, this could be because well-being is influenced by other factors such as social support, personal circumstances, and access to healthcare [24]. Despite the modest strength of the correlation, the results suggest that physical activity can play a role in enhancing well-being. These findings are consistent with research showing that physical activity helps reduce stress and contributes to better overall well-being. Encouraging pregnant women to engage in regular physical activity, even at light or moderate levels, can promote mental and physical health during pregnancy [25, 26]. The study emphasizes the importance of promoting safe, moderate physical activity during pregnancy to reduce stress and improve well-being. Culturally sensitive programs, community involvement, and stress-reduction strategies like counselling and mindfulness should be integrated into prenatal care. Enhanced mental health services and family support are also essential. Further research is needed to explore how ethnicity influences physical activity, stress, depression, and well-being during pregnancy.

This study is limited by its single-center, cross-sectional design conducted at one hospital OPD in Hyderabad, which restricts causal inference and generalizability across Pakistan's ethnically and socioeconomically diverse

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pregnant population, while non-probability purposive sampling further introduces selection bias. The reliance on self-reported questionnaires for physical activity and stress measurement also introduces recall and social desirability biases, and the exclusion of women with medical complications or on psychological medications may underrepresent higher-risk subgroups. Future research should employ longitudinal, multi-center designs across urban and rural settings with objective physical activity measurement tools such as accelerometers, and incorporate broader demographic diversity including different ethnic, educational, and socioeconomic groups. Additionally, randomized controlled trials evaluating the effectiveness of culturally adapted prenatal physical activity interventions integrating mindfulness, family support, and community-based components — should be conducted to establish causality and develop evidence-based guidelines for maternal mental health promotion in Pakistan.

CONCLUSIONS

It was concluded that a significant positive correlation was found between physical activity and well-being, and a significant negative correlation was found between physical activity and perceived stress, suggesting that increased activity is slightly associated with better well-being and reduced stress. It was also found that most mothers were performing light and fewer mothers were performing moderate physical activity, which the World Health Organization recommends. These findings emphasize the importance of promoting physical activity during pregnancy for improved mental health and overall well-being.

Authors' Contribution

Conceptualization: WA[1]
Methodology: WA[1], PA, AQ
Formal analysis: WA[1], PA, FS, HBC, WA[2], SR, AQ
Writing and Drafting: WA[1], PA, FS, HBC, WA[2], SR
Review and Editing: WA[1], PA, FS, HBC, WA[2], SR

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflicts of Interest

The authors declare no conflict of interest.

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