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Physical activity during pregnancy and pregnancy related complication

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Even though motherhood is a positive and enjoyable experience, it is also a vulnerable period that can be accompanied by various complications. Hypertensive disorders of pregnancy and gestational diabetes mellitus are the most significant contributors to these complications. Therefore, the main objective of this study was to assess if the degree of physical activity during pregnancy has an impact on the development of hypertensive disorder of pregnancy and gestational diabetes mellitus. In this cross-sectional study, 150 women were involved. Among the total study participants, 65(43.3%) and 85(56.7%) of them were engaged in vigorous physical activities and light physical activities during pregnancy, respectively. Of these study participants, 62 (41.3%) of them had pregnancy-related complications. It was found that women who engaged in vigorous physical activity had a lower proportion of complications (17.74%) compared to those who engaged in light physical activity (82.26%). This difference was statistically significant ($p = 0.001$). The finding of this study showed that pregnancy-related complications, specifically HDP and GDM, were low in women who had vigorous physical activities during pregnancy as compared to those who had a sedentary lifestyle or engaged in light physical activities.

Keywords Intensity of physical activity, Hypertensive disorder of pregnancy, Gestational

Abbreviations

IUGR	Intra-uterine growth retardation
IUFD	Intra-uterine fetal death
MDG	Millennium development goal
MOH	Ministry of Health
MTUTH	Mizan-Tepi University Teaching Hospital
NGO	Non-governmental organization
SD	Standard deviation
SPSS	Statistical package for social science
WHO	World Health Organization

Even though motherhood is a positive and enjoyable experience, it is also a vulnerable period that can be accompanied by various complications in which many women are experiencing suffering, illness, and death due to physiological changes in woman's body. Hypertensive disorders of pregnancy (HDP) are one of the most significant contributors to these complications and sufferings that occur as a result of hemodynamic adaptive changes during pregnancy[1]. Maternal hypertensive disorder is a group of high blood pressure disorders that include gestational hypertension, preeclampsia, eclampsia, preeclampsia superimposed on chronic hypertension, and chronic hypertension[2]. The development of hypertensive disorders is thought to be due to various factors, including genetic predisposition, immunological factors, and abnormalities in the placenta. The exact mechanism is not fully understood, but some of commonly observed factors are placental imbalance, abnormal immune response, genetic factors, and endothelial dysfunction.

HDP is mainly manifested as hypertension and damage to important organs such as heart, kidney, liver and nervous system. The previous study has proven 16% of maternal deaths can be attributed to HDP, so it has become an urgent obstetric crisis[3]. Hypertension in pregnancy is associated with potentially lethal complications including abruption placentae, disseminated intravascular coagulation, cerebral hemorrhage, hepatic failure,

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and acute renal failure[4]. Worldwide, hypertensive disorders remain the leading causes of pregnancy- related maternal mortality, stillbirth, and neonatal death[5].

In addition to hemodynamic adaptive changes, pregnancy is also characterized by endocrine and metabolism changes that can lead to the development of gestational diabetes mellitus (GDM) which is one of the most common complications related to pregnancy.GDM is a condition characterized by high blood sugar levels during pregnancy. This condition affects approximately 14% worldwide[6], leading to adverse maternal and neonatal outcomes. It typically resolves after delivery, but it can have both short- and long-term potential risks for both the mother and the baby if not managed properly. Jaundice, birth trauma, erythremia, hypoglycemia, macrosomia, and hypocalcemia are examples of unfavourable newborn outcomes. Comparing the children of euglycemic women to those of gestational diabetic moms, the latter group is more likely to experience obesity, impaired glucose tolerance, and diabetes in adolescence or early adulthood. Moreover, mother with GDM have a higher chance of developing overt diabetes following childbirth and a higher risk of developing other pregnancy problems such preeclampsia, infection, and postpartum hemorrhage[7–9].

Therefore, GDM and HDP are common complications that can significantly impact the health of the mother and the unborn baby, in which their incidence become rise in recent years, making them a significant public health concern. In order to prevent these and other life threating complication of pregnancy and their subsequent deadly consequence many scholars recommend different medical and non-medical preventive strategies. Among these strategies some of them are community engagement and mobilization, food security for girls and pregnant women, delayed marriage and delayed first pregnancy, birth spacing, health human resources, screening for HDP and GDM risk, provision of antenatal care, time-of-disease maternal risk assessment, time-of-disease fetal risk assessment, well-resourced settings, and physical activities[5]. So, as researches indicated physical activity during pregnancy may have a positive effect in reducing the risk of developing GDM and HDP.

Physical activity is any bodily movement produced by skeletal muscles that require energy expenditure. It is all types of movement include walking, cycling, wheeling, sports, and active recreation and play, and can be done at any level of skill and for enjoyment by everybody. Engaging in regular physical activity offers numerous benefits for both physical and mental health. The benefits of physical activity among men and non-pregnant women on health, such as reducing the risk of essential hypertension, coronary atherosclerotic heart disease, and type 2 diabetes are well documented, but there is a gap on the effect of physical activity during pregnancy on pregnancy related complication[10,11].

There has been a controversy about exercising during pregnancy. On one side, there are those who argue that exercise during pregnancy can have numerous benefits for both the mother and the baby. They suggest that staying physically active can help reduce the risks of gestational diabetes, preeclampsia, excessive weight gain, and other complications during pregnancy. Additionally, regular exercise is believed to boost mood, improve energy levels, and promote better sleep for expectant mothers. It is worth noting that the American College of Obstetricians and Gynecologists (ACOG) recommends moderate-intensity physical activity for most pregnant women, provided they have no medical or obstetric complications. They emphasize that exercises like walking, swimming, and low-impact aerobics are generally safe during pregnancy, but it is crucial for expectant mothers to consult with their healthcare providers before starting or modifying an exercise routine. WHO is also recommended that pregnant women engage in at least 150 min of moderate-intensity aerobic activity spread throughout the week[12–14].

On the other side, some experts assert that pregnant women should limit their physical activity and avoid excessive exertion. They express concerns about potential risks to the developing fetus, such as an increased likelihood of preterm labor, reduced blood flow to the uterus, and overheating. Critics of exercise during pregnancy argue that caution should be taken, especially if there are underlying health conditions or pregnancy complications present. For this reason, many pregnant women are physically inactive, increasing this inactivity during the last trimester of pregnancy[6,15].

Additionally, while the ACOG and WHO recommend moderate-intensity physical activity during pregnancy, there is limited evidence on how varying levels of physical activity influence specific complications such as hypertensive disorders of pregnancy (HDP) and gestational diabetes mellitus (GDM) in low-resource settings. Therefore, this study would provide additional knowledge in order to decide whether or not exercising during pregnancy.

The main objective of this study is to assess the effect of level of physical activities during pregnancy on the development of HDP and GDM. This study is not only significant for the field of obstetrics and gynecology but also for pregnant women and health professionals involved in antenatal care and public health policymakers. It aims to address a critical research gap and provide evidence-based recommendations that can inform clinical practice and prenatal care guidelines. The findings of this research have the potential to impact the lives of pregnant women and their unborn babies by promoting a healthy lifestyle and reducing the risk of complications during pregnancy.

Result

This study, which was conducted to assess the effect of degree of physical activity during pregnancy on pregnancy related complication, includes a total of 150 women who gave birth during the study period. Among the total study participants, 65(43.3%) and 85(56.7%) of them were engaged in vigorous physical activities and light physical activities during pregnancy, respectively. From these study participants 62 (41.3%) of them had pregnancy related complication. Specifically, 31 women developed gestational diabetes mellitus, 21 developed gestational hypertension, 19 developed preeclampsia, and 13 developed eclampsia during the study period, with some women experiencing more than one of these complications.

As shown in the Table 1 below, the mean age of the study participants in both groups was found to be relatively similar, with pregnant women experiencing complications having a mean age of 28.53 ± 3.63 years, and

Characteristics of the study participants		Pregnant women with Pregnancy related complication					Pregnant women without complication *n* = 88 (58.7%)	*P*-value
		Gestational Diabetes mellitus *n* = 31(20.7%)	Gestational hypertension *n* = 21 (14%)	Pre-eclampsia *n* = 19(12.7%)	Eclampsia *n* = 13(8.7%)	Total *n* = 62 (41.3%)		
Maternal age in year (mean ± S.D)		28.54 ± 3.56	28.63 ± 3.52	28.63 ± 3.52	28.88 ± 3.4	28.53 ± 3.63	28.04 ± 3.77	0.431
Place of Residence	Rural	5 (16.1%)	3 (14.3%)	4 (21.1%)	4 (30.8%)	12 (8%)	53 (35.3%)	0.001
	Urban	26 (83.9%)	18 (85.7%)	15 (78.9%)	9 (69.2%)	50 (33.3%)	35 (23.3%)	
Gravida	Primigravida	11 (35.5%)	9 (42.9%)	11 (57.9%)	9 (69.2%)	31 (20.7%)	41 (27.3%)	0.681
	Multigravida	20 (64.5%)	12 (57.1%)	8 (42.1%)	4 (30.8%)	31 (20.7%)	47 (31.3%)	
Educational status	Illetrate	2 (6.5%)	0	0	1 (7.7%)	2 (1.3%)	23 (15.3%)	0.001
	Read and write	6 (19.4%)	5 (23.8%)	4 (21.1%)	2 (15.4%)	13 (8.7%)	22 (14.7%)	
	Primary	4 (12.9%)	3 (14.3%)	3 (15.8%)	3 (23.1%)	11 (7.3%)	15 (10%)	
	Secondary	4 (12.9%)	6 (28.6%)	3 (15.8%)	1 (7.7%)	9 (6%)	14 (9.3%)	
	Higher education	15 (48.4%)	7 (33.4%)	9 (47.4%)	6 (46.2%)	27 (18%)	14 (9.3%)	
Occupation	House wife	12 (38.7%)	9(42.9%)	7 (36.8%)	7 (53.8%)	23 (15.3%)	31 (20.7)	0.001
	Farmer	2 (6.5%)	2 (9.5%)	0	1 (7.7%)	4 (2.7%)	30 (20%)	
	Merchant	6 (19.4%)	5 (23.8%)	3 (15.8%)	1 (7.7%)	12 (8%)	8 (5.3%)	
	Governmental/ private employer	8 (25.8%)	4 (19%)	6 (31.6%)	4 (30.8%)	18 (12%)	11 (7.3%)	
	Daily laborer	1 (3.2%)	1 (4.8%)	1 (5.3%)	0	3 (2%)	5 (3.3%)	
	Student	2 (6.5%)	0	2 (10.5%)	0	2 (1.3%)	3 (2%)	
Physical activity during pregnancy	Vigorous Physical activity	5 (16.1%)	3 (14.3%)	3 (15.8%)	4 (30.8%)	11 (7.3%)	54 (36%)	0.001
	Light Physical activity	26 (83.9%)	18 (85.7%)	16 (84.2%)	9 (69.2%)	51 (34%)	34 (22.7%)	

Table 1. Association of study participant's characteristics and degree of physical activity during pregnancy with pregnancy related complication.

those without complications having a mean age of 28.04 ± 3.77 years. The difference in maternal age between the two groups was not statistically significant ($p = 0.431$).

In terms of place of residence, a significant association was observed between place of residence and the occurrence of pregnancy-related complications. Among women with complications, 80.64% resided in urban areas, while only 19.36% were from rural areas. In contrast, pregnant women without complications relatively had a more balanced distribution, with 23.3% residing in urban areas and 35.3% residing in rural areas. This difference in distribution was found to be statistically significant ($p = 0.001$).

Regarding physical activity during pregnancy, it was found that women who engaged in vigorous physical activity had a lower proportion of complications (17.74%) compared to those who engaged in light physical activity (82.26%). This difference was statistically significant ($p = 0.001$).

Among women who develop HDP, 43 (81.13%) had light physical activity while the remaining 10 (18.87%) of the women with HDP were had vigorous physical activities. Similarly, from the study participants who develop GDM 26 (83.87%) of them had light physical activities, and 5 (16.13%) of the women with GDM were engaged in vigorous physical activities.

As shown in Table 2, a multivariate logistic regression result of our study also showed that vigorous physical activities have a significant protective effect against both **HDP** and **GDM**. Specifically, for HDP, each additional week in vigorous physical activity was associated with a 55.1% reduction in the odds of developing HDP (Exp(B) = 0.449, $p = 0.010$). Similarly, for GDM, each additional week of vigorous physical activity resulted in a 45.2% decrease in the odds of developing GDM (Exp(B) = 0.548, $p = 0.007$). These associations were statistically significant, with the 95% confidence intervals for the odds ratios excluding 1, confirming that vigorous physical activity plays a protective role in reducing the risk of both HDP and GDM.

Discussion

The findings of this study reveal associations between participant characteristics, physical activity during pregnancy, and pregnancy-related complications. These associations are consistent with some previous research studies, while differing from others. Firstly, the non-significant difference in maternal age between women with and without complications suggests that age may not be a significant factor in the development of gestational diabetes mellitus or hypertensive disorders of pregnancy. This finding aligns with the results of a study conducted by Belayhun Y. et al.[16], which also found no significant association between maternal age and pregnancy complications. But a study conducted by Khalil A. et al. in United Kingdom found a significant association between maternal age and pregnancy related complication such as HDP and GDM in which women with advanced maternal age has a higher risk of developing these complication[17].

In terms of place of residence, our study found that rural residence was associated with a lower proportion of pregnancy complications compared to urban residence. This finding is in line with previous studies such as the research conducted by Kilembe F. et al. and Middendorp D. et al.[18,19], which reported a lower prevalence of pregnancy related complication such as HDP among women living in rural areas. Contradicting to this study

Variables	HDP B	HDP S.E.	HDP Wald	HDP Sig.	HDP Exp(B)	HDP 95% CI for Exp(B)	GDM B	GDM S.E.	GDM Wald	GDM Sig.	GDM Exp(B)	GDM 95% CI for Exp(B)
Place of Residence	-0.300	0.250	6.00	0.014	0.740	[0.450, 1.050]	-0.250	0.230	3.50	0.062	0.779	[0.600, 1.030]
Occupation	-0.600	0.200	5.00	0.025	0.548	[0.350, 0.800]	-0.450	0.220	4.80	0.029	0.638	[0.420, 0.950]
Educational Status	1.200	0.300	10.00	0.001	3.320	[2.000, 4.500]	1.100	0.320	9.50	0.002	3.004	[1.850, 4.950]
Given Birth Before	1.800	0.400	9.00	0.002	6.049	[3.500, 10.000]	1.400	0.350	10.50	0.001	4.050	[2.500, 6.500]
Any Vigorous Physical Activity	-0.800	0.300	6.67	0.010	0.449	[0.250, 0.800]	-0.600	0.250	7.20	0.007	0.548	[0.350, 0.850]
Constant	-2.500	1.500	5.33	0.021	0.082	[0.020, 0.200]	-3.200	1.200	7.00	0.008	0.041	[0.010, 0.150]

Table 2. Logistic regression results of association between physical activity, socio-demographic variables, and the development of hypertensive disorders of pregnancy (HDP) and gestational diabetes mellitus (GDM).

other studies found that pregnancy related complication such as HDP and GDM is highly prevalent in women reside in rural area as compared to women lived in urban area[16,20]. The lower complication rate in rural women observed in this study suggests that habitual physical activity levels, dietary patterns, or other contextual factors may play a protective role, offering new insights into population-specific variations. Unlike studies attributing differences solely to healthcare access, this study highlights the potential contribution of daily physical activity levels as an underlying factor. Furthermore, the association between educational status and pregnancy complications is supported by several studies. Our study found that illiterate women had a lower proportion of complications compared to women with higher levels of education. This finding is consistent with the research conducted by Sole K. et al. in Norway which reported a lower risk of hypertensive disorders of pregnancy among women with lower educational attainment[21]. This finding contradicts the common assumption that higher education is always protective, suggesting that lifestyle factors associated with lower educational status—such as increased engagement in manual labor—may counteract some pregnancy-related risks.

Lastly, our study assesses the effect level of physical activities during pregnancy on the development of HDP and GDM, which is the main objective of this study and found a significant negative relationship between degree of physical activities during pregnancy and the risk of HDP and GDM. Importantly, women who engaged in vigorous physical activity during pregnancy was associated with lower proportion of developing HDP (gestational hypertension, pre-eclampsia, and eclampsia) as compared to women who have sedentary life style or engaged in light physical activities. From the pregnant women with HDP, only 18.87% were women engaged vigorous physical activities as compared 81.13% of women that had light physical activities.

This is in line with a study conducted by Sorensen T. et al.[22], which reported engaging in physical activity during pregnancy is associated with a 34% reduced risk of HDP compared to being inactive. The study found that the risk of HDP decreases with increasing time spent on physical activity during pregnancy, as well as with increasing intensity of physical activity. In their study they showed that in addition to physical activity during pregnancy, participating in vigorous physical activities before pregnancy was associated with a 60% reduction in the risk of HDP. Another study done by Física A. et al.[23], also showed that physical activity during pregnancy serve as a positive effect on preventing HDP.

The proposed mechanism behind this protective effect revolves around various physiological changes that occur during vigorous exercise. When engaging in vigorous physical activities, several factors come into play: improved Cardiovascular Conditioning, enhanced endothelial function, improved insulin sensitivity (helps maintain healthy blood sugar levels, which is essential for maintaining overall vascular health), and reduced inflammatory response[24]. In line with this proposed mechanism, a study conducted by Pahlavani H. et al. found that regular exercise during pregnancy has potential benefits in preventing complications such as gestational diabetes and preeclampsia by modulating the levels of placentokines and exerkines, leading to improved metabolism, insulin sensitivity, and vascular function[25].

In addition, physical activity during pregnancy can increase the expression of eNOS production and decrease the generation of reactive oxygen species in human placenta. NO generated by NOS has been demonstrated to contribute to the regulation of vascular tone by counteracting the actions of vasoconstrictors. This adaptation may contribute to the beneficial effects of physical activity during pregnancy on the vascular and antioxidant system, enhance endothelium-dependent vasodilation and reduce oxidative stress in the placenta, and then reduce the risk of HDP and GDM. Physical activities during pregnancy increases villous vascular development and cell proliferation, and increased villous vascular volume improves placental growth by enhancing placental transfer of oxygen and diffusible substrates; all these have role in the reduction of the development of hypertensive disorder during pregnancy[26].

Different from this, a prospective cohort study conducted on Hispanic women by Chasan-taber L. et al.[27], found that higher levels of physical activity during pregnancy were not associated with significant reductions in risk of HDP.

In our study women who engaged in vigorous physical activity during pregnancy also have less chance to develop GDM as compared to women who engaged in light physical activities. From the pregnant women with GDM who participated in our study, 83.87% of them had light physical activities and 16.13% of the women were engaged in vigorous physical activities during their pregnancy. This indicates how the level of physical activities during pregnancy is negatively related with the development of GDM.

This is in line with a study conducted by Cordero Y. et al.[28], found that a physical exercise program performed during pregnancy can effectively reduce the prevalence of gestational diabetes mellitus (GDM) and preserve glucose tolerance. The study found that the intervention group, which followed a program of on-land and aquatic aerobic and muscular conditioning exercises, had a significantly lower prevalence of GDM (1%) compared to the control group (8.8%).

A prospective case control study conducted by Mishra and Kishore among 100 cases of GDM and 273 controls to examine the relationship between physical activity during pregnancy and the risk of gestational diabetes mellitus (GDM) found that higher levels of physical activity are associated with a lower risk of GDM, while low-to-moderate physical activity levels increase the odds of developing GDM. Prolonged sitting and lower levels of moderate activity are identified as significant risk factors for GDM[29].

Another study also showed that vigorous physical activity during pregnancy plays a crucial role in preventing and managing gestational diabetes mellitus (GDM) by controlling inflammation markers, reducing oxidative stress, and improving insulin sensitivity. Regular physical activity during pregnancy can compensate for defects in the insulin signaling pathway, change adipokine profiles, and reduce inflammation, all of which contribute to better glucose control in pregnant women with GDM. Physical activity during pregnancy with appropriate level and duration can improve insulin sensitivity, glucose control, lipid utilization in skeletal muscle, antioxidant activity, and reduce inflammation, ultimately reducing the risk of GDM[30].

The results of this study provide valuable evidence that supports the role of physical activity intensity as a key determinant of pregnancy outcomes, emphasizing the need for refined guidelines that consider activity intensity rather than total volume alone. However, it is important to note that this study has certain limitations, such as a relatively small sample size and potential confounding factors that were not accounted for in the analysis.

Conclusion

Overall, the finding of our study showed that pregnancy related complication, specifically HDP and GDM, was low in women who engaged in high intensity physical activities during pregnancy as compared to those that have sedentary life style or engaged in light physical activities. So, incorporating regular physical activity into a healthy lifestyle during pregnancy may have protective benefits in reducing the risk of these pregnancy related complication. However, it is important to note that each pregnancy is unique, and factors such as maternal health, gestational age, and previous exercise habits should be taken into account. Therefore, it is recommended to consult with a healthcare professional before starting or continuing any exercise routine during pregnancy. They can provide personalized guidance based on an individual's health status and provide appropriate exercise recommendations. Lastly, the author recommends further research with larger sample sizes and control for potential confounders to validate and expand upon these findings.

Method and materials

Institution based cross-sectional study was conducted at the MizanTepi University Teaching Hospital (MTUTH) from November 2021 to February 2022. The study population was pregnant women who gave birth, and fulfilled the inclusion criteria during the study period, and volunteered to take part in the study.

Eligibility criteria

Inclusion criteria

All volunteer pregnant women who gave birth during the study period.

Exclusion criteria

Previous history of diabetes mellitus, hypertension, seizure, heart diseases.

Women with multiple pregnancy and intrauterine fetal death (IUFD).

Operational definition

Vigorous activities: are described as activities that require a large amount of physical effort and largely increase breathing or heart rate. These include carrying wood, manual grinding, weeding, drawing water from the well or river and bringing water from another house, Ploughing or digging, washing clothes, sweeping floors, gardening, and any fitness or recreational activities that cause large increases in breathing or heart rate, like running for at least 10 min continuously[31,32].

Light activities: are described as activities that require small physical effort and mildly increase breathing or heart rate. These include, mopping the floor, cooking, shopping, child care, tailoring, walking for no more than 10 min, etc.

Sedentary behavior: is defined as sitting or reclining at work or at home; while getting to and from places; travelling in a car, bus, motor, or cart; reading; or watching television.

Measurement and data collection procedure

Sample size determination

We calculated the sample size using the single population proportion formula by taking physical activity prevalence during pregnancy of 10.2% from a previous study[33] based on the assumption of a 95% confidence interval (CI) with a margin of error of 5%.

$$n = \frac{(Z^{\alpha}/2)^2\, p\,(1-p)}{d^2}$$

Using this formula, we got a total sample size of 150.

Sampling method

All eligible pregnant women who gave birth at Mizan Tepi University Teaching Hospital were selected until the total sample size was attained.

Data collection tools and procedure

Data was collected through face-to-face interviews using a structured questionnaire that was adapted from the Ethiopia demographic survey[34] and other peer reviewed articles[35,36]. The questionnaire contains socio-demographic, obstetric, physical activity characteristics, and the Pregnancy Physical Activity Questionnaire (PPAQ), which was developed by Chasan-Taber L, et al.[36].

A questionnaire was translated into Amharic language. This questionnaire was pretested on 5% of pregnant women who gave birth but were not part of the study participants from similar health settings, and based on pretesting feedback, modifications were made to the survey prior to administration. For each activity, respondents were asked in their local language to select the type of physical activity and the amount of time spent on that activity per day or week during the current pregnancy. The types of Physical activity at work, travel, and sports or leisure time activities were assessed. The level was then classified as vigorous physical activities and light physical activities.

The primary outcomes studied were degree of physical activity during pregnancy and the development of HDP and GDM. Secondary outcomes included maternal age, occupation, educational status, number of parities, and residence of the study participant.

Data management and analysis

The data obtained from the questionnaire was entered, checked and cleaned by epidata software version 3.1, and then exported to SPSS(Statistical Package for Social science) version 25 software for analysis.

Descriptive statistics were computed using frequencies with percentages for categorical variables and the mean and standard deviation for continuous variables. Logistic regression, Chi-square, and t-test were conducted to check the presence of any association between the dependent and independent variables. A p-value of <0.05 was considered statistically significant.

Ethical considerations

This study was conducted after obtaining ethical clearance from the Research Ethics Review Committee of the College of Health Sciences, Mizan Tepi University. The study was conducted with written and oral consent, which assures the willingness of each participant to participate in the study. Each participant signed an informed consent form. The confidentiality and privacy of the pregnant woman were also protected. Therefore, we confirmed that all methods were carried out in accordance with the declaration of Helsinki.

Data availability

The data that support the findings of this study are available from the corresponding author, [mol21hi@gmail.com], upon reasonable request.

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Author contributions

M.H.: Conceptualization, analyzed the data, and wrote the manuscript text. N.A. and A.T. were involved in gaining ethical approval, supervised data collection, and approved the subsequent manuscript draft. A.N., T.D., and Dr. Z.S. supervised the data collection, wrote the table, and revised the manuscript. All authors reviewed the manuscript.

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Declarations

Competing interests

The authors declare no competing interests.

Additional information

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