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Research Article

Effect of Physical Activity Education on Reducing Low Back Pain and Improving Exercise Attitude Among Pregnant Women

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Abstract

Low back pain (LBP) is a prevalent musculoskeletal complaint during pregnancy, associated with physiological and biomechanical changes that limit daily activity. Structured physical activity and educational interventions have been shown to reduce pain and improve maternal attitudes toward exercise. The aim of this study was to evaluate the effect of a booklet-based physical activity education program on the incidence of LBP and attitudes towards physical activity among pregnant women. This quasi-experimental study employed a one-group pretest-post-test design without a control group. Participants included 33 pregnant women in the second and third trimesters attending a primary health centre in Bantul, Yogyakarta, Indonesia. A pretested questionnaire was used to collect data on sociodemographic characteristics, the occurrence of low back pain, and attitudes towards physical activity during pregnancy. The intervention consisted of structured physical activity education using a handbook containing recommended prenatal exercises, ergonomic guidance, and safe practice tips, delivered over three weeks. Data were analysed using the Wilcoxon signed-rank test with significance level α=0.05. A total of 29 respondents were included in the study. The median LBP score decreased from 5 to 2 post-intervention ($Z = -4.737$, $p < 0.001$). The proportion of participants with a positive attitude towards physical activity increased from 37.9% to 89.7% ($Z = -3.638$, $p < 0.001$). Physical activity education using a booklet significantly reduced LBP intensity and improved physical activity attitudes among pregnant women. Integration of structured exercise education into antenatal care services is recommended to promote maternal comfort.

INTRODUCTION

Pregnant women experience physical changes during pregnancy, which can cause discomfort to the musculoskeletal system. Several studies suggest that 80% of pregnant women experience back pain (1). The prevalence of low back pain in pregnant women in all periods of pregnancy is 28.3% in the first trimester, 36.8% in the second

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trimester, and 47.8% in the third trimester (2). This discomfort is primarily attributed to physiological and biomechanical adaptations associated with pregnancy, including increased lumbar lordosis, ligamentous laxity due to hormonal changes, and an anterior shift in the center of gravity. These factors result in mechanical overload of the lumbosacral region, leading to pain and limited mobility (3). Low back pain is not only caused by pregnancy, but is influenced by daily activities that can worsen the ability of pregnant women to carry out daily activities such as physical care, walking, and sitting (4).

Persistent LBP during pregnancy can also affect daily functioning, sleep quality, and emotional well-being (5), marginally restrict their daily living activities and quality of life (6), sleep disturbance (7). Treatment of lower back pain in pregnant women can reduce pain and physical disability (8). Research demonstrates that consistent physical activity throughout pregnancy is both safe and advantageous, enhancing cardiovascular health, muscle strength, and psychological adjustment (9).

Physical exercise, providing therapy of transcutaneous electrical nerve stimulation (TENS), and progressive muscle relaxation effectively decreased LBP (10). Furthermore, health education treatments that integrate physical training with knowledge dissemination have demonstrated synergistic advantages, since they enhance women's self-efficacy, motivation, and competencies to sustain healthy behaviors during pregnancy (11).

Although many studies have shown that physical activity is very beneficial for the health of pregnant women and reduces LBP, the attitude of pregnant women towards physical activity is still low (12). Mothers who exercise independently and regularly can reduce complaints of LBP and lumbopelvic pain (13). The exercise programs combined with education can alleviate pain, enhance mobility, and improve maternal attitudes towards physical activity (14). However, in many primary healthcare settings, standardized education materials for promoting physical activity during pregnancy remain limited. This study aimed to evaluate the effect of booklet-based physical activity education on the incidence of low back pain and attitudes towards physical activity among pregnant women in Indonesia.

METHOD

Study Design and Participants

This study employed a one-group pretest–posttest design due to feasibility considerations within the primary healthcare context. The study was designed as an exploratory investigation to assess the preliminary impact and practicality of the intervention prior to conducting larger controlled trials. The study was conducted between February - May 2024 in the working area of a primary health Centre in Bantul, Yogyakarta, Indonesia. A purposive sample of 33 pregnant women in the second and third trimesters was recruited, with 29 participants completing the study (drop-out rate 15.2%). Inclusion criteria were as follows: 1) presence of low back pain, 2) singleton pregnancy, 3) second and third trimester of pregnancy, 4) no history of low back pain before pregnancy, 5) living at home with husband, 6) body mass index 18,5 – 24,9, 7) absence of medical contraindications such as heart disease, gestational diabetes, incompetent cervix, risk for premature contraction, preeclampsia, and 8)consent to participate.

Instrument

The women in this study were asked to fill in a questionnaire. Data collection instruments included: 1) a demographic questionnaire, 2) a low back pain intensity scale, using a numeric rating scale (NRS), and 3) a physical activity attitude questionnaire. The demographic

questionnaire consisted of five questions containing maternal age, gestational age, education, occupation, and parity. The second instrument is a numeric rating scale (NRS), this instrument was valid and reliable, used to measure low back pain (15). In this questionnaire, respondents were asked to rate their LBP on a scale of 1–10. Scores closer to 10 indicate increasingly severe pain(16). The third instrument is Attitude Activity for exercise. This instrument has 8 questions with a Likert scale. The results of the instrument score measurement ≥ 25 indicate a positive attitude of pregnant women, while a score <25 indicates a negative attitude of pregnant women. The instrument is valid and reliable, with a Cronbach's alpha of 0,720 (17). The last instrument is the handbook on physical activity. The intervention involved structured physical activity education using a guidebook. The guidebook contained guidance on six safe pregnancy postures, back exercises, pelvic tilt, posture, and body mechanics during activities (standing, sitting, sleeping, squatting, lifting), and positions for pregnant women during activities at home (sweeping, mopping, reading, and walking). The handbook used had undergone validity testing with three maternity nursing experts, with a score of 0.8.

Data collection

Pregnant women who participated in the study were obtained from the community health center data. After obtaining informed consent, the respondents were asked to complete the instrument. The physical exercise was explained with the aid of a handbook that includes pregnancy exercises, back exercises, pelvic tilt, posture, and body mechanics during activity. Women were first educated about physical activity during pregnancy. Later, the researchers demonstrated the exercise, and women were asked to perform it. This intervention was provided to each pregnant woman once.

After the education session, each pregnant woman was given the handbook and was to perform the physical activity at home, following the instructions in the handbook, every day for 30 minutes. Next, the researcher conducted monitoring by contacting respondents via WhatsApp daily to remind them to practice physical activity. At 4 weeks after the first meeting, the researchers visited the respondent's home to conduct the posttest. Pregnant women completed the NRS and Attitude activity questionnaire.

Statistical Analysis and Ethical Considerations

Data was analyzed using a computer application, and the Wilcoxon signed-rank test was applied to assess pre- and post-intervention differences, with significance set at $p < 0.05$. Ethical approval was obtained from the Research Ethics Committee, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta (No. 064/EC-KEPK FKIK UMY/I/2024). Written informed consent was obtained from all participants.

RESULTS

A total of 29 pregnant women completed this study. Table 1. shows that the characteristics of respondents based on age have a median value of 26 years, the youngest mother's age (minimum) is 15 years, and the oldest age (maximum) is 38 years with a standard deviation of 5.253. Gestational age, parity, occupation, and education.

Table 1
Distribution of respondent characteristics based on respondent age

Indicator	Median	Min	Max	SD
Age	26	15	38	5,253

Table 2. shows that the respondents of pregnant women in the second trimester of pregnancy amounted to 16 people (55.2%). Furthermore, table 10. also shows that the

number of respondents of primiparous pregnant women amounted to 15 (51.7%) and the employment status of the respondents of pregnant women was mostly unemployed, namely 22 people (75.9%), while the level of education of the respondents of pregnant women mostly had a high level of education, namely 21 (72.4) respondents.

Table 2
Distribution of respondent characteristics based on gestational age, parity, occupation, and education

Indicators	n	%
Gestational Age		
Trimester II	16	55.2
Trimester III	13	44.8
Parity		
Primipara	15	51.7
Multipara	14	48.3
Occupational		
Doesn't work	22	75.9
Work	7	24.1
Education		
Low Level	8	27.6
High level	21	72.4
Total	29	100.0

Table 3 shows the level of LBP pain before and after the intervention. The level of pain before the intervention had a median value of 5. While the level of pain after the intervention had a median value of 2. The lowest value (minimum) before the intervention was 2, and the highest value (maximum) before the intervention was 10. The lowest value (minimum) after the intervention was 0 and the highest value (maximum) after the intervention was 7. the Wilcoxon test of physical activity education with the incidence of low back pain in pregnant women with a Z value of -4.737 and an a symp sig value (2-tailed) of 0.000 is smaller than the α level of 5% (0.05) so that H1 is accepted, namely that there is an significans of providing physical activity education on the incidence of low back pain in pregnant women.

Table 4 shows the level of physical activity attitude before and after the intervention. The frequency of attitude before the intervention was a negative attitude in as many as 18 (62.1%) and a positive attitude in 11 (37.9%). While the level of attitude after the intervention had a frequency of negative attitude as many as 3 (10.3%) and positive attitude 26 (89.7%). The Wilcoxon test of physical activity education with physical activity attitude, with a Z value of -3.638 and a sig value (2-tailed) of 0.000, is smaller than the α level of 5% (0.05), so that H1 is accepted, namely that there is an influence of providing physical activity education on physical activity attitudes in pregnant women.

Table 3
Distribution of respondents' LBP levels

Indicators	Median	Min.	Max.	SD	Z	Asymp.Sig
LBP score before intervention	5	2	10	2,089	-4,737	0,000
LBP score after intervention	2	0	7	1,951		

Table 4
Distribution of respondents' attitude levels

Indicators	f	%	Z	p
Pretest Physical Activity Attitude				
Negative	18	62.1		
Positive	11	37.9		
Postest Physical Activity Attitude			-3.638	0,000
Negative	3	10.3		
Positive	26	89.7		
Total	29	100.0		

DUSCUSSION

This study shows that the median age of respondents is 26 years. Age is one of the factors that can influence the occurrence of low back pain during pregnancy. This study is in line with research conducted by Pisoh (18) which shows the ideal age for pregnant women is 20-35 years, because in this age range the reproductive organs and mental abilities are more mature, so the risk of complications is lower. Other studies have shown that younger maternal age is associated with a higher risk of experiencing LBP compared to older age (19), but this is not in line with other studies, which show no significant relationship between maternal age and LBP (20).

The gestational age is categorized into two, namely the 2nd and 3rd trimester. Based on the research conducted, it shows that the gestational age of trimester III is more than that of trimester II, with a percentage of 52.9%. Gestational age has been shown to influence the incidence of LBP in pregnant women. As gestational age increases, the incidence of LBP also increases (21). This is associated with increasing uterine size and increased pressure on the mother's spine as gestational age increases. This increase in LBP incidence does not significantly impact the level of LBP pain experienced by pregnant women (22).

Based on this study, the primipara rate is 51.7%. Parity can also affect low back pain in mothers with a history of more than one birth when compared to mothers who are experiencing pregnancy for the first time. In line with other studies, this indicates that some respondents were primiparous (23). Parity influences the incidence of LBP, with mothers with a history of previous pregnancies experiencing higher pain intensity. The Primiparous mothers have better and stronger muscle strength than multiparous mothers because they have never experienced abdominal muscle stretching (21).

Based on this study, most respondents were unemployed, with a percentage of 75,9%. Both unemployed and employed mothers experience LBP, which is in line with other research that shows there is no significant difference between LBP and the mother's occupation (23). In other studies by Omoke et al. (2021) that there are several household chores such as cleaning, mopping, sweeping, splitting and cooking using firewood, taking and carrying buckets of water, and taking care of children. This can put pressure on the lower back, as well as cause changes in body load and mechanics during pregnancy, which can easily settle and worsen low back pain. One of the causes of low back pain while working is sitting for too long, improper sitting position, non-ideal body posture, and excessive activity. Many working mothers do not pay attention to good body mechanics, such as a forward-looking body position while working, sitting too long, which causes muscle tension and ligaments to stretch the body backward, and when sitting in the wrong body position, it creates abnormal pressure, which causes pain.

Based on the research conducted, most respondents have a high level of education, namely 72,4%. The mother's educational background influences the mother in receiving information or education. Other research shows that 86.3% of respondents who have a high level of education also have a high prevalence of LBP (19) (21). However, Research shows that there is no significant difference in the incidence of LBP between educational groups (23). This study aligns with Berber (2020) [26], who found that most pregnant women experienced LBP during pregnancy (75,3%). Low back discomfort was predominantly reported during the third trimester (85.5%) and localized in the lumbar region (45.5%).

This study shows that providing education using a handbook to pregnant women can reduce low back pain (LBP) and improve attitudes toward physical activity. Pregnant

women received education on physical activity, including prenatal gymnastics, back exercises, and proper posture during daily activities. There was a decrease in the average LBP score and an improvement in attitudes toward physical activity after practicing physical activity for 30 days. LBP was measured using the Numeric Rating Scale (NRS). These results emphasize the essential role of organized educational interventions in promoting attitude change and improving musculoskeletal health during pregnancy. The findings align with prior studies indicating that focused education in combination with self-directed exercise instruction can significantly alleviate discomfort and enhance physical health in pregnant women(25).

A study shows that physical activity in pregnant women can reduce LBP and improve the mother's ability to carry out daily activities (26). Pregnant women who receive education increase their knowledge and understanding of physical activity during pregnancy. Pregnant women who have good knowledge about the benefits and contraindications of physical activity have a positive attitude about physical activity and practice physical activity during pregnancy (27) .

Other relevant research is Charpentier (2020) which is related to back pain and the ability of pregnant women to perform daily activities in Canada. The study compared two groups with different characteristics. Pregnant women in group one had a higher percentage of severe low back pain of 83% with a high level of severe disability of 33%, when compared to pregnant women in group two, who had a lower percentage of severe low back pain of 58% and a lower level of severe disability than group one, namely 14%.

These findings are consistent with recent international evidence indicating that structured exercise programs combined with educational components can alleviate pregnancy-related musculoskeletal discomfort. A recent systematic review and meta-analysis reported that interventions integrating exercise and education were more effective in reducing low back and pelvic pain during pregnancy compared with education alone (29). Our findings align with this evidence, suggesting that educational strategies may enhance pregnant women's understanding, self-efficacy, and adherence to recommended physical activity.

The structured exercise increased moderate-to-vigorous physical activity levels during pregnancy compared with standard care. However, the same study noted that motivational counselling alone did not significantly increase overall physical activity behavior (30). This distinction is important in interpreting our results. While we observed significant improvements in exercise attitudes, changes in attitude do not automatically translate into sustained behavioral change. This phenomenon is consistent with contemporary behavioral science literature, which emphasizes that attitude improvement is only one determinant of health behavior adoption, alongside environmental, interpersonal, and structural factors.

Educational interventions during pregnancy have been shown to positively influence women's understanding, motivation, and confidence to engage in safe physical activity. By increasing awareness of the benefits and safety of regular exercise, education reduces fear-avoidant beliefs and misconceptions about movement that often contribute to sedentary behavior and worsening LBP. Enhanced maternal understanding can positively influence a mother's approach to engaging in activities throughout pregnancy (31).

From a practical perspective, this handbook educational intervention has strong potential for integration into routine antenatal care services. The booklet can be

delivered during standard antenatal visits as part of health education sessions, either individually or in small groups, without requiring additional infrastructure or specialized equipment. Nurses and midwives play a central role in implementing this intervention by providing structured education, reinforcing key messages, and monitoring mothers' understanding and adherence to recommended physical activity guidelines. The use of handbooks by midwives to provide education can improve the health of pregnant women (32). Given its low cost, low technical requirements, and ease of replication, this intervention is particularly feasible for primary care settings with limited resources. The handbook's simplicity enables wide dissemination and scalability, making it suitable for low- and middle-income contexts where access to digital or intensive behavioral interventions may be limited.

This study provides preliminary evidence regarding the association of the education intervention within a primary healthcare setting. However, as the research was conducted at a single center with a relatively small sample size, the findings should be interpreted with caution and cannot be generalized beyond comparable healthcare contexts. Future studies should replicate this research across diverse regions and cultural settings, using larger and more heterogeneous samples to strengthen external validity. In addition, subsequent investigations should incorporate baseline assessments of physical activity and control for potential confounding variables, such as social and family support, to provide a more comprehensive understanding of the intervention's true effect.

Another limitation of this study is the lack of a control group, so the findings should not be interpreted as confirmatory evidence of effectiveness. The lack of a comparison group limits causal inference, and further research using a randomized controlled design is needed to establish the intervention's effectiveness.

CONCLUSION

The results of our study demonstrate that physical activity education has a positive impact on low back pain and exercise attitudes among pregnant women. However, further research is required to strengthen these findings by involving larger sample sizes and incorporating cultural considerations. Importantly, although the frequency of positive attitudes toward physical activity increased, this improvement does not necessarily translate into actual behavioral change in engaging in physical activity during pregnancy. Therefore, continued investigation in this field is essential, particularly in light of the global trend of insufficient adherence to recommended minimum levels of physical activity. Future studies should place greater emphasis on evaluating behavioral outcomes related to physical activity among pregnant women. From a public health perspective, interventions should prioritize the promotion of physical activity and healthy lifestyles during pregnancy through structured educational programs, as these efforts may have long-term benefits for both maternal health and future generations.

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