Analysis of Physical Activity Against Musculoskeletal Disorders in Pregnant Women in Plaju Health Center

By Putri Rizki Amalia Badri

ABSTRACT

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SUMMARY

During pregnancy, pregnant women can experience some complaints of discomfort that can be caused by hormonal changes and physical changes associated with an enlarged uterus. Complaints of discomfort such as pain in the waist, shoulders and other limbs is one symptom of Musculoskeletal Disorders (MSDs). Excessive physical activity can cause MSDs but regular [17]ysical activity such as pregnancy exercises contribute to preventing musculoskeletal disease. The purpose of this study is to analyze the relationship of physical activity to [17]mplaints of MSDs in pregnant women in the Plaju Public Health Center of Palembang city. This research used a quantitative approach with cross sectional study design. 110 trimester II pregnant women were selected by purposive sampling at the Plaju Puskesmas. The results showed a significant relationship between physical activity (p-value = 0.033) and occupation (p-value = 0.015) . Pregnant women who work with excessive physical activity and work can cause MSDs.

Keywords: Physical Activity, MSDs
Literature: 37 (2003-2019)

1. INTRODUCTION

During pregnancy, pregnant women can experience some complaints of discomfort that can be caused by hormonal changes and physical changes associated with an enlarged uterus. Complaints include leg cramps, nausea, vomiting, chest pain, vaginal discharge, constipation, headache, fatigue, dyspnea, hypertension, low back pain and others (Amasha, 2013). Lower back pain is a symptom of Musculoskeletal Disorders (MSDs). MSDs are disorders of the musculoskeletal system that cause symptoms such as pain due to damage to nerves and blood vessels in various locations of the body such as the neck, shoulders, wrists, hips, knees, and heels (Mayasari et al., 2016). Yasobant's research on MSDs in pregnant women found that some (50.7%) of participants reported symptoms of MSDs including acute low back pain as much as 55.6%, chronic low back pain as much as 35.4%, ankle pain acute as much as 25.9%, knee pain as much as 1.6%, neck pain as much as 4.9% and shoulder pain as much as 4.4% (Yasobant, Nibedita, Saswata, Arnansu, & Kirti, 2014). Low back pain is the most common complaint of MSDs felt by pregnant women. Complaints of the musculoskeletal system generally occur due to excessive muscle contraction due to giving too much weight with a long duration of loading. Conversely, muscle complaints may not occur if muscle contractions only range between 15-20% of maximum muscle strength. However, if muscle contractions exceed 20%, then blood circulation to the muscles decreases according to the degree of contraction which is affected by the amount of energy needed. If MSDs complaints are not resolved, pregnant women will experience a discomfort that can lead to stress, insomnia and other sleep disorders. MSDs can also trigger hemorrhoids, make digestion less efficient, interfere with breathing, blood circulation and cause low blood pressure (Fauziah, 2018).

2. RESEARCH METHOD

2.1 Study Design and Data Collection

This research is an analytic survey research that uses cross sectional research design. This research was conducted at the Puskesmas working area of Plaju Palembang City.

1.1 Sampling Techniques

The sample of pregnant women in this study was taken using a purposive sampling technique, namely taking subjects not based on strata, random or region but based on the existence of certain objectives. Sample size

was calculated using the formula of the sample size of the cross-sectional hypothesis test design obtained 50 people x2 into 10 samples. To avoid dropouts during the study, the number of samples was added by 10% of the total sample, so that the sample size in this study was 110 people.

1.2 Data Collection Techniques

Primary data were collected using the PPAQ (Pregnancy Physical Activity Questionaire) questionnaire for physical activity data and MSDs complaints using the Nordic Body Map. Physical activity using a cutt of point> 143 is categorized more and ≤143 is categorized as normal. MSDs complaints are categorized as yes and there are no MSD complaints.

1.3 Data Analysis

Bivariate analysis was used to analyze the impact of physical activity on MSDS risk of pregnant women using the chi square test. Multivariate analysis was performed using logistic regression because the dependent variable of this study was categorical.

3. RESULTS

3.1 Univariate Analysis

3.1.1 Characteristics of Research Respondents

Univariate data analysis was used to determine the frequency distribution of respondents' characteristics including the age of pregnant women, education, occupation, income, parity status, history of illness, pregnancy exercise and history of MSDs before becoming pregnant. The univariate analysis results of each variable are presented in the following table:

Table 3.1 Characteristics of Respondents

Variable	Frequency
Age	
High Risk	21
Low Risk	89
Education	
Low	36
High	74
Occupation	
Housewife	56
Working	54
Pendapatan	
<UMR	60
>UMR	50
Weight Gain	
>15 kg	13
<15 kg	97
Parity	
Multiparous	33
Primiparous	77
Pregnancy Gymnastics	
No	100
Yes	10
Disease History	
Yes	25
No	85
MSDs History	
Ya	4
No	106

Based on Table 3.1, it was found that the highest frequency of pregnant women at age with low risk was 80.9% while high risk was only 19.1%. The highest frequency of

pregnant women in higher education was 67.3% while the low risk was 32.7%. The highest frequency of pregnant women in the working category was 50.9% while not

working was 49.1%. The highest frequency of pregnant women at <UMR income was 54.5% while> UMR was 45.5%. The highest frequency of pregnant women on the addition of BB KG 15 KG was 88.2% while the addition of> 15 kg was 30%. The highest frequency of pregnant women in the primipara category was 70% while multipara was 30%. The highest frequency of pregnant women in the category of not having a history of chronic disease was 77.3% while those with chronic disease were 22.7%. The highest frequency of pregnant women who did not participate in pregnancy exercise was 90.9% while those who participated in pregnancy exercise was 9.1%. The highest frequency of pregnant women in the category of not having a history of MSDs before pregnancy was 96.4% while those who had a history of MSDs before pregnancy were 3.6%.

3.1.2 Frequency Distribution of physical activity

Univariate data analysis was used to determine the frequency distribution of characteristics of pregnant women 's activities. The univariate analysis results of each variable are presented in the following table:

Table 3.2 Frequency Distribution of Physical Acticity

Physical Acticity	Total Physical Acticity			
	Over (>143)		Normal (≤143)	
	N	%	N	%
Sedentary				
Over	36	69	16	31
Normal	17	29	41	71
Light				
Over	42	76	13	24
Normal	11	20	44	80
Moderate				
Over	35	63	20	37
Normal	18	32	37	68
Severe				
Over	21	48	22	52
Normal	32	47	35	53
Household				
Over	40	72	15	28
Normal	13	23	42	77
Occupation				
Over	16	55	13	45
Normal	37	46	44	54
Exercise				
Over	29	61	18	39
Normal	24	38	39	62

Based on Table 3.2 shows total physical activity divided into sedentary physical activity, mild physical activity, moderate physical activity, strenuous physical activity, household physical activity, physical activity of the work, and physical activity of sports. More physical activity that has more categories, mostly in light activity by 76%, households by 72%, settled by 69%,

moderate by 63%, sports by 61% and work by 55%.

3.1.3 MSDs Frequency Distribution

Univariate data analysis was used to determine the frequency distribution of characteristics of pregnant women 's activities. The univariate analysis results of each variable are presented in the following table:

Table 3.3 Frequency Distribution of MSDs

VARIABLe	FREQUENSI	%
Neck		
Yes	28	
No	82	
Shoulder		
Yes	44	
No	66	
Upper arm		
Yes	5	
No	105	
Lower arm		
Yes	5	
No	105	
Hand		
Yes	12	
No	98	
Back		
Yes	5	
No	105	
Low Back		
Yes	91	
No	19	
Buttock		
Yes	28	
No	82	
Thigh		
Yes	7	
No	103	
Knee		
Ya	7	
Tidak	103	
Lower limb		
Yes	7	
No	103	25,5
Foot		74,5
Yes	17	
No	40	93
		60
		45

Based on Table 3.3, the highest frequency of MSDs complaints occurred at the waist location of 82.7% of pregnant women, followed by shoulder as much as 40%, neck and hip as much as 25.5%. The locations where mothers complained the least were their upper arms, forearms and back with a percentage of 4.5% each.

3.2 Bivariate Analysis

Bivariate analysis is performed to assess the relationship or influence between independent and dependent variables. The results of the bivariate analysis are presented in a table showing the p-value.

Table 3.4 Bivariat Analysis

Statistical test results showed a p-value of 0.033 (p-value <0.05) which means there is a relationship between physical activity and MSDs for pregnant women at the Plaju Health Center in Palembang. The value of

| | MSDs | | | | Total | | p-value |
| | Yes | | No | | | | |
	N	%	N	%	N	%	
Physical activity							
Over	52	48,7	1	4,3	53	100	0,033
Normal	49	52,3	8	4,7	57	100	
Age							
High Risk	19	19,3	2	1,7	21	100	0,681
Low Risk	82	81,7	7	1,3	89	100	
Education							
Low	33	33,1	3	2,9	36	100	1,000
High	68	67,9	6	6,1	74	100	
Occupation							
Work	55	51,4	1	4,6	56	100	0,015
Housewife	46	49,6	8	4,4	54	100	
Income							
<UMR	58	55,1	2	4,9	60	100	0,076
>UMR	43	45,9	7	4,1	50	100	
Parity status							
Multiparous	31	30,3	2	2,7	33	100	0,721
Primiparous	70	70,7	7	6,3	77	100	
Chronic Disease							
Cronic	23	23	2	2	25	100	1,000
No	78	78	7	7	85	100	
Weight Gain							
>15 kg	12	11,9	1	1,1	13	100	1,000
< 15 kg	89	89,1	8	7,9	97	100	
Pregnancy Gymnastics						100	100	0,59
No	92	91,8	8	8,2	10	100	
Yes	9	9,2	1	8			
MSDs History							
Yes	4	3,7	0	3	4	100	1,000
No	97	97,3	9	8,7	106	100	

Prevalence Ratio (PR) shows 8.490 means that pregnant women who have physical activity are 8.490 times higher risk of experiencing MSDs than pregnant women who have normal physical activity (95% CI 1,302-6,326). Statistical test results showed a p-value of 0.015 (p-value <0.05) which means there is a relationship between work and MSDs for pregnant women at the Plaju Health Center in Palembang. The value of the Prevalence Ratio (PR) indicates 9.565, meaning that pregnant women who work have a risk of 8,490 times higher to experience MSDs than pregnant women who do not work (95% CI 1,153-79,325). In this study, there was no relationship between maternal age, education, parity status, income, weight gain, pregnancy exercise, history of illness and history of MSDs.

4. DISCUSSION

4.1 Relationship of Physical Activity to MSDs of Pregnant Women

From the results of the study found significant physical activity significantly towards MSDs with a p-value of 0.033. Physical activity of pregnant women is more in the normal category with 57 pregnant women with 49 pregnant women who complained of MSDs and 8 people who did not complain of MSDs. A total of 53 pregnant women who had more physical activity, 52 pregnant women complained of MSDs and only 1 person who did not complain of MSDs. This indicates that pregnant women who have more physical activity can increase the risk of MSDs. Physical activity itself is defined as any body movement produced by skeletal muscle that requires energy expenditure (WHO, 2019). Complaints of the musculoskeletal system generally occur due to excessive muscle contraction due to the provision of workload that is too heavy with a long duration of loading. However, if muscle contractions exceed 20%, then blood circulation to the muscles decreases according to the degree of contraction which is affected by the amount of energy needed. This can cause a decrease in oxygen supply to the muscles. Decreased oxygen supply can cause disruption of carbohydrate metabolism resulting in the accumulation of lactic acid which can cause pain in the muscles (Fauziah, 2018).

Total physical activity consists of sedentary, mild, moderate, strenuous, household, work and sports physical activities. In the study, it was found that total physical activity was the highest category in light activity by 76%,

households by 72%, settled by 69%, moderate by 63%, sports by 61% and work by 55%. Light physical activity consists of cooking, washing dishes, bathing children while sitting, feeding children while sitting, playing with children while sitting and standing, washing clothes, ironing, shopping, cleaning the house, walking to a place and standing or walking slowly in workplace without carrying anything. Household activities include cooking, washing dishes, bathing children, playing with children, cleaning the house, ironing. Regular physical activity is recommended for overall health benefits, especially in the prevention of chronic diseases and unhealthy weight gain. During pregnancy, the main components that promote a healthy lifestyle include appropriate physical activity and weight gain. Recommendations regarding exercise during pregnancy have developed throughout the years. Traditional medical advice has encouraged women to reduce energy levels in pregnancy, based on concerns that exercise can negatively affect pregnancy outcomes or increase the risk of maternal musculoskeletal injury. The American Academy of Obstetricians and Gynecologists and the Centers for Disease Control and Prevention / guidelines for American sports medicine courses

recommend 30 minutes or more of moderate-intensity physical activity a week (Fauziah, 2018).

The results obtained from mothers who have more physical activity, pregnant women who have a family income <UMR more than mothers who have income> UMR. From the observations obtained only a few pregnant women who use household assistants so they have to do their own household activities. In addition to doing household physical activities, pregnant women also do physical work activities. Among other jobs are washing laborers, tailors, employees, nurses, teachers, stall traders, SPG and gas station staff. Work activities such as sitting at work, standing at work with or without carrying goods can also create increased mechanical stress on pregnant women. Washing workers, warung traders, employees and tailors can do long sitting activities with a monotonous posture so that it can cause muscle fatigue. Nurses, teachers, SPGs and gas station staff can do long standing work activities with or without carrying weights which can also cause muscle fatigue. The biomechanical approach is based on the premise that the physical aspects of work contribute to MSDs. Biomechanical factors have been suggested to cause MSDs through two mechanisms:

overload and repetitive load on the spinal structure. Overload can occur when lifting heavy loads, awkward postures, and repetitive movements that result from the number of longer lifting cycles in a long period of time. Biomechanical factors such as lifting, awkward postures, static postures, repetitive spinal movements, whole body vibrations, and heavy loads have been found to be risk factors for MSDs. The burden on the spine that accompanies the above risk factors has also been found to be associated with MSDs (Sabino & Grauer, 2008).

From the results of the study it was found that the highest frequency of MSDs complaints occurred at the waist location by 82.7% of pregnant women, followed by the shoulder by 40%, neck and hip by 25.5%. The locations that were the least complained were the upper arm, forearm and back with a percentage of 4.5% each. The results of research conducted by Kesikburun who get complaints experienced by pregnant women on the waist, back, neck, shoulders, hands and hips. Pregnancy alone can trigger biomechanical, hormonal and vascular changes that can increase the risk of MSDs. Biomechanical changes are caused by uterine enlargement and weight gain.

Changes in the joints of the body of pregnant women due to hormonal changes that fluctuate. Fluid retention causes compression of soft tissue which can increase the risk of injury to the musculoskeletal system. Complaints that are often experienced by pregnant women are in the upper extremities, lower extremities, cramps and peripheral neuropathy. Low back pain during pregnancy can be caused due to physiological changes, hormonal changes and increased body mass during pregnancy thereby increasing mechanical stress on the spine. Enlarged uterus, lumbar compensations for lordosis and a shift in the center of gravity can increase tension in the bones, muscles, ligaments in the lumbar region. In addition, the abdominal muscle wall stretches especially the rectus abdominis during pregnancy so that it cannot maintain posture. As a compensatory effect, the paraspinal muscles which will perform all the functions over time will cause fatigue. During pregnancy, mechanical changes make the joints adapt. Shoulder, hip, knee, and leg pain are also common complaints during pregnancy (Kesikburun, 2018). Back pain is

caused by a combination of mechanical, hormonal, blood circulation, and psychosocial factors. Discomfort in this area can also cause changes in the posterior pelvic region, especially the sacroiliac joints that experience changes during pregnancy. This can cause pain in the lumbar region and / or spread to the hips and posterior thighs. MSDs can occur continuously or occasionally depending on a certain position or after many activities. About one third of patients report that pain can increase while a third of patients report that the pain worsens at night so that sleep is often disturbed (Sabino & Grauer, 2008).

4.2 Relationship between Age of Pregnant Women to MSDs

The results showed no significant relationship between the age of pregnant women with MSDs with a p value of 0.681 (p value> 0.05%). Low risk age is more prevalent in this study than high risk age. Pregnant women who have a low risk age of 89 people with 82 people complained of MSDs and 7 people did not complain of MSDs. Pregnant women who have a high risk age as many as 21 people with 19 people who complained of MSDs and 2 people who did not complain of MSDs. High risk age is> 35 years and under 17 years, but in the study only found pregnant women> 35 years with the smallest 17 years of age. Pregnant women with high risk and complain of MSDs most at the age of 36 years as many as 11 people, 37 years as many as 3 people, 38 years 2 people, 39 years 1 person, 40 years 3 people and 43 years 1 person. This is in line with research conducted by Lardon also found that there was no relationship between the age of pregnant women and MSDs with a p-value of 0.143 (Lardon, St-Laurent, Babineau, Descarreaux, & Ruchat, 2018).

Pregnant women aged> 35 years are more at risk for developing MSDs due to decreased organ function including the musculoskeletal system. The increasing age of pregnant women, the higher the risk of getting MSDs. This is in accordance with the BKKBN statement which states that the ideal age for a woman to get pregnant is in the age range of 20-35 years. At this age is a safe age for childbirth and the fertility period is in peak condition. Women who are more than 35 years old often experience pregnancy complications that can affect fetal

growth and development. Everyone has a different way of dealing with and interpreting pain. The way a person responds to pain is the result of many pain events throughout his life span. According to Potter & Perry there is a relationship between pain with age, namely at the level of development. Adults will experience neurophysiological changes and may experience decreased sensory perception of the stimulus as well as an increase in the pain threshold. The explanation above provides an illustration in this study that the perception and response of pain that is affected by age is a result of neurophysiological changes and the effects of events over their life span (Yosefa & Hasneli, 2008).

4.3 Relationship of Pregnant Women's Education to MSDs

The results showed there was no relationship between education with MSDs of pregnant women at the Palembang City Plaju Health Center with a p-value of 1 (p-value> 0.05). The results of the study showed that there were more high categories than the low category. Higher education as many as 74 people with 68 pregnant women who complained of MSDs and 6 people who did not complain of MSDs. Low education as many as 36 people with 33 people who complained of MSDs and 3 people who did not complain of MSDs. Low education in this study are elementary, junior high, high school while higher education starts from D1, D3, and S1. In the research, it was found that the lowest education was elementary school and the highest was S1. This is in line with research conducted by Uemora, which found that there was no educational relationship with MSDs with a p value of 0.719. Research conducted by Backhausen found that the level of education affected musculoskeletal complaints. Education affects the cognitive function, psychology and behavior of pregnant women in dealing with pain. The higher the mother's education, it is expected that the higher the level of awareness to deal with pain with pregnancy exercises. A total of 10 pregnant women who do pregnancy exercise, 5 people with high education and 5 people with low education. In this study only a few did pregnancy exercise, meaning that a high level of maternal education had not been able to support the awareness of mothers to improve their health during pregnancy (Yosefa & Hasneli, 2008).

A person who attains a higher level of education shows a lower prevalence rate for developing MSDs than a person with a low or secondary level of education. The Batista study found that the relationship between education levels affected the occurrence of MSDs. Education level can be an important psychosocial factor to be used in prevention and treatment approaches for MSDs. Low and secondary education levels can be seen as risk and / or prognostic factors. It is possible that people's adherence to risky behavior is greater in people with lower levels of education. One possible cause of the higher prevalence of MSDs among people with secondary and lower education levels may be that these people are exposed to workloads and work activities that are different from people with higher education levels. Psychological factors are also linked to the occurrence of MSDs. Thus, education may not only be associated with the occurrence of MSDs. Individuals with a bachelor's degree or higher level of education have a lower probability of experiencing MSDs than those who only have high school education or drop out of school. Education improves physical functioning and health because it enhances a sense of personal control that encourages and enables a healthy lifestyle such as walking regularly, exercising, avoiding being overweight. Education enables people to unite health producing behaviors into coherent lifestyles. That is done by increasing the sense of control over the results in one's own life. According to Mullah, it was found that more educated people had more time to do physical training than less educated individuals. The study above shows that the level of education is strongly associated with factors such as regular physical exercise, avoiding being overweight. All of these factors are useful in preventing pain in musculoskeletal (Committee on Physical Activity and Physical Education in the School Environment, 2013).

4.4 Relationship of Pregnant Women 's Work to MSDs

The results of the study found that there was a relationship between work with MSDs of pregnant women at the Palembang City Plaju Health Center with a p-value of 0.015 (p-value> 0.05). Research found that working mothers more than non-working. There are 56 working mothers with 55 people complaining about MSDs and 1 person not complaining about MSDs. There are 54 unemployed mothers with 46 people complaining about MSDs and 8 people not complaining about MSDs. Working mothers

consist of informal and formal work. A total of 56 pregnant women working informally consisted of 22 stall traders and 3 washing workers, 1 tailor, 1 cashier, 1 gas station employee. Formal occupations consist of 10 teachers, 2 nurses, 15 employees. Working pregnant women who do not experience MSDs work as employees. From the research results obtained from 56 working mothers, there are 37 mothers who have income <UMR. This shows, pregnant women work one of them because of lack of income to meet their daily needs. Work alone can affect MSDs. Pregnant women must spend extra energy to do their work and household, for example a washing worker can do his work in more than 1 place thereby increasing the risk of MSDs. This is in line with Uemora's research which found a relationship between work and MSDs with a p value of 0.032. Physical factors present in work procedures, equipment and the environment can cause biomechanical pressure on muscles, tendons and some nerves. Force, repetition, extreme posture, or long-term static and vibration postures are considered to be the main risk factors associated with physical work on MSDS. Daily work hours exposed to physical factors and rest or recovery time between work activities are the main organizational factors for MSDS. Mental tension can cause muscle tension and in this case can increase the existing physical tension. Some work conditions that can cause mental tension according to Cabecas work are psychologically demanding, where workers are faced with high levels of work stress, work pressure, and mental demands. Activities with low social support at work by coworkers, supervisors, and company managers can also increase MSDs. Women work and have a career, in today's development is no longer a rare phenomenon. According to Ningrum, working women are women who work outside the home and get paid. The need for self-actualization fulfillment, income or salary and other factors are often considered to be the most basic reasons for a woman to work. Women who are working or career women decide to have a child or start the stage of pregnancy is not easy, because being a working mother has greater difficulties than mothers who do not work. There are feelings of anxiety that they experience when they decide to start a pregnancy, these feelings of anxiety are usually related to the continuation of their careers. Work productivity is essentially an economic motive to get as much results as possible with the smallest cost, how to

produce or improve the results of goods and services as high as possible by utilizing resources efficiently. According to Matlin the situation in pregnancy is unpredictable, because a woman will experience various kinds of emotions during the 9-month period of her pregnancy. Since the beginning of pregnancy, before experiencing physical changes, pregnant women have experienced psychological changes. For example, the emotion of a pregnant woman tends to change quickly, at one time she feels very happy, but a few moments later she feels depressed (Adiyanti & Nanda, 2018).

Limitation of the amount of work during pregnancy is recommended to avoid fatigue, forms of heavy homework or heavy work outside the home should be avoided. Completing homework is more tiring and draining than work in the office. Therefore, the company is obliged to guarantee protection for women workers who are pregnant, because they are in a very vulnerable condition and therefore must be avoided from excessive workload. Law No.13 of 2013 article 82 regulates the right of maternity and maternity leave for women. Women workers have the right to rest for 1.5 months before giving birth and 1.5 months after giving birth (Adiyanti & Nanda, 2018).

4.5 Relationship of Income of Pregnant Women to MSDs

The results showed there was no relationship between income with MSDs of pregnant women at the Palembang City Plaju Health Center with a p-value of 0.076 (p-value> 0.05). Pregnant women with the highest MSDs at <UMR compared to> UMR. Mothers who have family income <UMR are 60 people with 58 people complaining about MSDs and 2 people who are not complaining about MSDs. Pregnant women who have an income> 50 percent of UMR with 43 pregnant women who complained of MSDs and 7 pregnant women who did not complain of MSDs. Low income can make pregnant women work to meet the economic adequacy of the household. Awareness of social inequalities in health has existed for decades, and although the efforts made in have made progress in reducing inequality between social groups in general, Baron's research confirms that social inequalities in health continue in pregnancy. Theories proposed to maintain this health gap include inadequate income redistribution, health inequality more related to immaterial factors such as cultural factors, and people with higher socioeconomic status who are relatively more benefited from improved services

health than people with low socioeconomic status. Non-optimal maternal health conditions such as obesity, underweight, stress and depression and health behaviors such as smoking, alcohol consumption and unhealthy nutrition have been linked to adverse pregnancy outcomes. Non-optimal health conditions and behavior are consistently found to be more common among people of lower socioeconomic status for example as indicated by lower levels of education. These differences are important determinants of health disparities in general and during pregnancy. In addition, pregnancy-related conditions such as nausea, and pelvic pain, generally considered normal in pregnancy, can increase depression in women and potentially cause isolation and decreased social support in some pregnant women. Social inequalities in health conditions during pregnancy such as nausea, back pain and pelvic pain and health behaviors such as skipping breakfast and dinner before had little attention. To provide information and to better adjust and target interventions to promote maternal health and positive pregnancy outcomes, it is important to gain better insight into differences in the prevalence of maternal health indicators and suboptimal behavior across social groups

(Fliesser, De Witt Huberts, & Wippert, 2018).

4.6 Relationship of parity status with MSDs

The results showed there was no relationship between parity status and MSDs of pregnant women at the Palembang City Plaju Health Center with a p-value of 0.721 (p-value> 0.05). This research gets more primipara than multipara. A total of 77 primipara with 70 people who complained of MSDs and only 7 people who did not complain of MSDs. A total of 33 multipara people with 31 people who complained of MSDs and 2 people who did not complain of MSDs. This is in line with the Uemora study which found no relationship between parity status and MSDs with a p value of 2,779. Multiparous is more risky than nulliparous because of the number of children the mother has to take care of, but more studies have found primipara. Age in this study also get more low-risk that is the age of 17 years to 35 years. This age is not at risk for getting MSDs. At the time of the study, mothers with multipara status tended to assume the usual pain they experienced, in contrast to nulliparous mothers who felt more and complained about various locations of the body.

High parity will increase the risk of MSDs. Thus the more often a woman is pregnant and giving birth then the risk of MSDs during pregnancy increases. Anatomic and physiological changes that occur during pregnancy cannot be fully restored after the pregnancy and delivery are complete. Even some changes that occur will be settled. Likewise with musculoskeletal changes, muscle tone that stretches in a previous pregnancy cannot recover as before pregnancy especially if after pregnancy does not do proper physical exercise. As a result, the muscles of the abdomen and uterus will relax. The muscles of the female abdomen are so weak that they fail to support the enlarged uterus, causing the uterus to relax, further stretching. This will increase the risk of back pain. Abdominal muscle weakness is more common in women who are too often pregnant (grand multipara) who do not do exercises to restore their abdominal muscle tone after each delivery (Yosefa & Hasneli, 2008).

4.7 Relationship Addition of BB Pregnant Women to MSDs

The results of the study found there was no relationship between education and MSDs of pregnant women at the Palembang

City Plaju Health Center with a p-value of 1 (p-value> 0.05). The addition of body weight <15 kg is more common than> 15 kg. As many as 97 mothers who experienced additional BB, there were 89 people who complained of MSDs and 8 people who did not complain of MSDs. As many as 13 pregnant women who have added body weight> 15kg, there were 12 people who complained of MSDs and only 1 person who did not complain of MSDs. In the study did not get a relationship between weight gain and MSDs because weight gain occurred in the third trimester, while in the study the samples taken were in the second trimester where weight gain was not too significant.

The hypothesis of weight gain on the occurrence of low back pain in pregnant women is related to the increase in maternal abdominal diameter and the center of gravity being anterior to the spine which causes pressure on the lower back and ultimately causes low back pain. Changes in the center of gravity become more anterior associated with changes in posture of pregnant women which causes lordosis of pregnant women. Increased pressure on the spinal region causes a decrease in the height of the vertebral discs so that the spine is increasingly compressed and causes ongoing pain. Weight gain during pregnancy can

significantly increase strength in all joints such as hips and knees by as much as 100% during daily activities. Weight gain with joint looseness can cause joint discomfort. Weight gain will shift the body's center of gravity anteriorly and increase the arm's moment of strength applied to the lumbar spine. Studies show that anterior shifts are associated with symphysis problems. Furthermore, postural changes might be implemented to balance the anterior shift, which leads to lordosis, and increased curvature into the natural spine, further increasing stress on the lower back. The intervertebral disk responds to axial loading by releasing fluid, resulting in decreased height and overall compression of the spine. The abdominal muscles also stretch to accommodate the expanding uterus. When they stretch, they lose the ability to do so in the function of maintaining posture, causing the lower back to support most of the weight gain. Studies comparing pregnant women enrolled in exercise programs designed to overcome core strength, flexibility, and muscular endurance, specifically abdominal strength, with those involved in not exercising programs, show reduced changes in posture and the severity of pain in the exercise group (Sabino & Grauer, 2008).

4.8 Relationship of Pregnancy Gymnastics to MSDs

The results of the study found there was no relationship between education and MSDs of pregnant women at the Palembang City Plaju Health Center with a p-value of 1 (p-value> 0.05). Mothers who did not take part in pregnancy exercises were more often found than mothers who took pregnancy exercises. A total of 110 mothers who did not attend pregnancy exercise 92 mothers who complained of MSDs and 8 mothers who did not experience MSDs. As many as 10 pregnant women who participated in pregnancy exercise, there were 9 people who complained of MSDs and only 1 person who did not complain of MSDs. Pregnancy exercises can reduce MSDs in pregnant women but in studies only a few are doing pregnancy exercises. Mothers who do pregnancy exercises also do not routinely do so, so the effects of pregnancy exercises in the musculoskeletal system are not very influential. It is known that pregnancy exercises can reduce pain in the musculoskeletal system because it can prevent excessive stress on the pelvic ligaments and endorphins that come out during pregnancy exercises. The endorphin hormone itself functions as a sedative and is able to reduce pain by inhibiting opioid

receptors found in nerve cells (Delima & Susanti, 2015).

When doing pregnancy exercises especially on the movement of the transverse muscle exercises can train the tone of the inner transverse abdomen which is the main postural support of the spine. Likewise pelvic base training, with this movement can maintain muscle tone so that it can continue to function properly and this exercise will increase the resistance of postural muscles that twitch slowly twitching at the base of the pelvis. In addition, regular pregnancy exercises can reduce back pain because the movement contained in pregnancy exercises can strengthen the abdominal muscles so as to prevent excessive tension in the pelvic ligament so that the intensity of the pain becomes reduced. Besides doing pregnancy exercises can release endorphins in the body, where the function of endorphins is as a calm and can reduce back pain in pregnant women. Endorphin stimulates opioid receptors in the peripheral, dorsal horn, and brain stem. Each endogenous opioid class has a tendency for different opioid receptors. Neurotransmitters such as norepinephrine, serotonin, acetylcholine and γ-aminobutyric acid are all involved in pain inhibition through various mechanisms.

Norepinephrine and serotonin reduce pain by modulating descending impulses from the brain. Exercise during pregnancy if pregnant women meet the following requirements; The sport that was chosen to be carried out did not have an extreme element of jumping and strength, pregnant women were declared healthy, gestational age had exceeded its first crisis period, which is more than 3 months from pregnancy to 9 months of pregnancy. Changes in the musculoskeletal system are a common problem experienced by third trimester pregnant women in the musculoskeletal system is pain in the lower back. Mothers who experience back pain are usually characterized by the main symptoms of pain or other discomfort in the spinal region so that it can interfere with pregnant women in activity. Back pain in pregnant women can be overcome, one of them by doing pregnancy exercises. Regular pregnancy exercise is believed to reduce pain (Yosefa & Hasneli, 2008).

4.9 Relationship of Disease History to MSDs

The results showed there was no relationship between education with MSDs of pregnant women at the Palembang City

Plaju Health Center with a p-value of 1 (p-value> 0.05). Mothers who did not experience chronic disease were more often found than mothers who had chronic disease. As many as 85 people who did not experience chronic disease, there were 78 who complained of MSDs and 7 people who did not complain of MSDs. As many as 25 people who experienced chronic disease, there were 23 people who complained of MSDs and only 2 people who experienced MSDs. Pregnant women who have a history of chronic diseases who complain of MSDs as many as 23 people consisting of hypertension as many as 15 people, DM as much as 2 people, as much as 8 people gastritis. Pregnant women who experience chronic disease but do not complain of MSDs as many as 2 people.

In the study did not get a relationship because of the possibility of diabetes suffered by pregnant women who have not experienced microangiopathic or macroangiopathic complications that can cause MSDs. History of chronic diseases in this study consisted of hypertension, diabetes mellitus, gastritis and asthma. The disease can also cause musculoskeletal complaints in the shoulder. Pregnant women who have a history of chronic diseases can limit their physical activities so that the musculoskeletal system can also experience decreased function. Hypertension causes vascular disorders to occlusion of blood vessels which can cause pain in the shoulder. Symptoms of hypertension vary widely, ranging from headaches, dizziness, nausea, vomiting, muscle and joint pain. Generally these symptoms can disappear arise. The effect of hypertension on the body's organs is considered to be an elevation in blood pressure which causes damage to the tunica intima arteries. Diabetes mellitus that has lasted a long time can cause disruption in the musculoskeletal system which includes the structure of bones, joints, muscles and soft tissues. Insulin resistance that occurs in patients with type 2 DM causes hyperglycemia. Glucosuria that occurs in people with DM causes increased osmotic and oncotic pressure resulting in hemoconcentration. When the blood fluid thickens, it can cause narrowing of the arteries. Microangiopathy and macroangiopathy cause a decrease in blood supply to organs especially musculoskeletal. Diabetics can complain of pain in the shoulder due to changes in the musculoskeletal system. Peripheral nerves are prone to injury in pregnancy, maternity and postpartum with several mechanisms including compression, traction, ischemia

and less often laceration. Activities of daily living and child care, especially those that require repetitive or prolonged positions in the upper limb, are also associated with peripheral nerve injury of the upper limb (Noehardi, 2008).

4. 10 Relationship History of MSDs to MSDs

The results of the study found there was no relationship between education and MSDs of pregnant women at the Palembang City Plaju Health Center with a p-value of 1 (p-value> 0.05). Pregnant women who have no history of MSDs are more found than mothers who have a history of MSDs. A total of 106 mothers who had no history of MSDs with 97 who complained of MSDs and 9 people who did not complain of MSDs. A total of 4 people had a history of MSDs with 4 people complaining of MSDs and no one complained of MSDs. History of MSDs is also considered to be one of the risks of MSDs as in the Uemura study which found a significant relationship between the history of MSDs with complaints of MSDs with a p-value of 0.001 but the study conducted by Lardon did not get a significant p-value relationship between the history of MSDs with MSDs complaints in mothers when pregnant. Women with previous lumbar problems or chronic back pain conditions are more likely to develop back pain during pregnancy, with pain that occurs twice more often than those without prior complaints. They also tend to have severe pain and be durable. Along the same line, women who experience back pain during one pregnancy have a 85% chance of experiencing back pain during the next pregnancy (Sabino & Grauer, 2008).

5. CONCLUSION

The results of physical activity research with MSDs in pregnant women at the Puskesmas Plaju Palembang can be summarized as follows:

1. The highest frequency of characteristics of pregnant women at age with low risk is 80.9%, higher education is 67.3%, working is 50.9%, income <UMR is 54.5%, addition of BB <15 kg is 88, 2%, primipara by 70%, not following pregnancy exercises by 90.9%, no history of chronic disease by 77.3% and no history of MSDs by 96.4%.

2. More physical activity which has more categories, mostly in light activity by 76%, households by 72%, settled by

69%, moderate by 63%, sports by 61% and work by 55%.

3. The highest frequency of MSDs complaints occurred at the waist location as much as 82.7% of pregnant women, followed by shoulder as much as 40%, neck and hip as much as 25.5% and. The discomfort score with a high category occurred at shoulder location by 60%, waist by 58.9%, neck and hip respectively by 25.5%.

4. Total physical activity is significantly related (p value <0.05) to MSDs.

5. Work is significantly related (p value <0.05) to MSDs.

ETHICAL APPROVAL

This research will be carried out after obtaining approval from the Research Ethics Committee of the Faculty of Public Health, Sriwijaya University to ensure that the proposed research is ethically acceptable and that the rights of study participants are protected.

REFERENCES

Adiyanti, A., & Nanda, N. (2018). Studi Kasus Wanita Bekerja Menjelang Masa Melahirkan. *Jurnal RAP (Riset Aktual Psikologi Universitas Negeri Padang)*, *9*(2), 118. https://doi.org/10.24036/rapun.v9i2.102208

Amasha, H. A. (2013). Maternal Awareness of Pregnancy Normal and Abnormal Signs: An Exploratory Descriptive Study. *IOSR Journal of Nursing and Health Science*, *2*(5), 39–45. https://doi.org/10.9790/1959-0253945

Committee on Physical Activity and Physical Education in the School Environment. (2013). Committee on Physical Activity and Physical Education in the School Environment; Food and Nutrition Board; Institute of Medicine; Kohl HW III, Cook HD, editors. Educating the Student Body: Taking Physical Activity and Physical Education to School. *Food and Nutrition Board; Institute of Medicine*. https://doi.org/10.17226/18314

Delima, M., & Susanti, N. (2015). *Pengaruh Senam Hamil Terhadap Penurunan Tingkat Nyeri Punggung Bawah Pada Ibu Hamil Trimester Ii Dan Iii Di Puskesmas Parit Rantang Payakumbuh Tahun 2015*. 79–89.

Fauziah, N. (2018). No TitleHUBUNGAN ANTARA POSISI TUBUH DENGAN KELUHAN MUSKULOSKELETAL PADA PETANI PADI DI DESA SILONGO KECAMATAN LUBUK

TAROK KABUPATEN SIJUNJUNG. *JOM FKp*, *5*. Retrieved from https://jom.unri.ac.id/index.php/JOMPSIK/article/view/21194/20507

Fliesser, M., De Witt Huberts, J., & Wippert, P. M. (2018). Education, job position, income or multidimensional indices? Associations between different socioeconomic status indicators and chronic low back pain in a German sample: A longitudinal field study. *BMJ Open*, *8*(4), 1–7. https://doi.org/10.1136/bmjopen-2017-020207

Kesikburun, S. (2018). Musculoskeletal pain and symptoms in pregnancy: a descriptive study. *Ther Adv Musculoskel Di*, *10*(12), 229–234. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6262502/pdf/10.1177_1759720X18812449.pdf

Lardon, E., St-Laurent, A., Babineau, V., Descarreaux, M., & Ruchat, S. M. (2018). Lumbopelvic pain, anxiety, physical activity and mode of conception: A prospective cohort study of pregnant women. *BMJ Open*, *8*(11), 1–11. https://doi.org/10.1136/bmjopen-2018-022508

Mayasari, D., Saftarina, F., Ilmu, B.,

Komunitas, K., Masyarakat, K., & Kedokteran, F. (2016). Ergonomi sebagai Upaya Pencegahan Musculoskeletal Disorders pada Pekerja Ergonomi as The Prevention of Musculoskeletal Disorder ' s. *JK Unila*, *1*(2), 369–379.

Noehardi, M. (2008). https://journal.uny.ac.id/index.php/medikora/article/view/4813. *Medikora*, *2*(4). Retrieved from https://journal.uny.ac.id/index.php/medikora/article/view/4813

Sabino, J., & Grauer, J. N. (2008). Pregnancy and low back pain. *Current Reviews in Musculoskeletal Medicine*, *1*(2), 137–141. https://doi.org/10.1007/s12178-008-9021-8

WHO. (2019). *The Global Strategy on Diet, Physical Activity and Health (DPAS)*. Retrieved from https://www.who.int/nmh/wha/59/dpas/en/

Yasobant, S., Nibedita, S., Saswata, S., Arnansu, M., & Kirti, S. (2014). Musculoskeletal problems among pregnant women: A facility based survey in Odisha. *International Journal of Medical Research & Health Sciences*, *3*(2), 358.

https://doi.org/10.5958/j.2319-
5886.3.2.075

Yosefa, F., & Hasneli, Y. (2008). Efektifitas
senam hamil terhadap penurunan nyeri punggung pada ibu hamil. *Kebidanan*.

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Crossref

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