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2nd Sriwijaya International Conference on Public Health (2nd SICPH) was held in 6th to 7th November 2019 at 101 Hotel Palembang, Indonesia. This seminar is a continuation of first event on 2017 organized by Faculty of Public Health, Sriwijaya University (UNSRI). The theme of this second seminar is "The Impact of Climate Change on Infectious Disease Transmission".

Please click [here](#) for the conference website. (*Conference website no longer available.*)

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[Correlation Between Components of Gender Development to Women of Childbearing Age Couples Morbidity in Remote Indigenous Community of Suku Anak Dalam at Sungai Terap Area and Nyogan of Jambi Province, Indonesia](#)

Asparian, Evy Wisudariani

Results of MDGS in 2015 declares that maternal mortality rate (MMR) in Indonesia still at 305/100.000 live births level, which still far away from the target of 105/100.000 live births. Maternal morbidity and mortality rates are more risky at those with low social, cultural, political, and economic status,...

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[Nanoparticle of Silver Nitrate \(Ag₂NO₃\) and Organophosphate \(C₁₀H₁₉O₆PS₂\) for Vector Control of Anopheles Larvae](#)

Mursid Raharjo, Agus Subagyo, Sulistiyi

The climate change has an impact on various lives, including in the vector breeding. The Anopheles resistance as an infectious agent of Plasmodium is harmful for life, especially to non-target organisms and the environment. Nano-silver (Ag₂NO₃), is a new form of engineering in vector control. The aim...

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[Family Awareness of Congenital Rubella Syndrome in Palembang, Indonesia](#)

Amrina Rosyada, Dini Arista Putri, Rini Mutahar

Rubella infection is a dangerous infectious disease that mostly affects pregnant women. This infection causes children born with some disabilities called congenital rubella syndrome which is visual impairment, deafness, calcification of the brain, and heart trouble. Treatment for this syndrome is quite...

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[Association Between Toothbrushing and Cardiovascular Disease Risk Factors: A Systematic Review](#)

Sabrina Intan Zoraya, Abdillah Adipatria Budi Azhar

Background: Cardiovascular disease is still the leading cause of death globally. For a decade, interest has been growing in linking cardiovascular disease risk factors and oral hygiene. A method that is commonly applied to maintain oral hygiene is toothbrushing. The purpose of this review is to synthesize...

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Identification of Road Safety Hazards in the Roadway of Palembang-Indralaya

Desheila Andarini, Anita Camelia, Dwi Septiawati, Novrikasari

One of common problem in the road user accident is the condition of road infrastructure. Road accidents was categorized as the ninth rank of death most common cause in 1990 and are estimated to be the third by 2020. Road Safety Audit is needed to identify and eliminate potential hazards from roads and...

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Safety Analysis of Light Rail Transit in Palembang

Novrikasari, Desheila Andarini, Mona Lestari, Poppy Fujianti, Sarah Aprilisa, Anita Camelia

As the first rail-based mass transportation means for moving and transporting passengers / goods, the additional function of Light Rail Transit is as a tourist attraction. People flocked to try to use Light Rail Transit. This study aims to analyze the safety of Light Rail Transit in Palembang. Method...

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Analysis of Physical Activity on the Quality of Life of Pregnant Women in the Plaju Public Health Center, Palembang

Muthia Felyanti, Novrikasari, A. Fickry Faisya

Many pregnant women who do not understand what physical activities can be done during pregnancy that will affect the quality of life of pregnant women. A good quality of life is associated with good eating and drinking arrangements, a balance of daily routine activities, work, exercise, rest, to recreational...

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

Putri Rizki Amalia Badri, Novrikasari, Rostika Flora

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)...

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Reliability Evaluation of Emergency Reponse Plan Design in Buildings of Sriwijaya University 2019

Anita Camelia, Fatmalina Febry, Sayang Ajeng Mardhiyah, Poppy Fujianti, Adji Randika, Anggun Ikha Maqpiroh

Sriwijaya University consists of several different buildings for administration and academic purpose to student accommodations. A proper Emergency Response Plan (ERP) is an important factor in ensuring the safety of building occupants from hazard such as fire, as it may reduce evacuation time and prevent...

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Effect of Glyphosate Herbicide on Environmental Health

Akhmad Dwi Priyanto, Daniel Saputra, Fuad Abd. Rachman, Rico Januar Sitorus

One of the active ingredients of herbicide is Glyphosate (N-(phosphonomethyl) glycine) which is widely used in plantation land. Herbicide residues will accumulate in agricultural products, pollution in the environment (water, air and soil), poisoning in humans both acute and chronic that have an impact...

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Factors Affecting the Infectious Waste Management System on Practice Disposal Waste Among Health Workers in Bengkulu Hospital

Afriyanto, Somsak Pitaksanurat, Rittirong Junggoth, Noor Alis Setiyadi

Hospital activities restore health and save lives at the same time, however, they can generate infectious wastes to a human being or the environment. Infectious waste have to used specifically treatment for reduce waste. In most of hospital of Bengkulu Indonesia do not use an incinerator and then good...

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Spatial Analysis of Water Quality in Area of the Riverbank of Musi River in Palembang City

Inoy Trisnaini, A. Fickry Faisya, Haerawati Idris

The report by WALHI in 2016 showed that based on the quality status of the Musi River water in Gandus District is in abad status, which means that it has been polluting, which can come from the high activity of citizens and industry in the riverbank on that river. Geographic Information System (GIS) as...

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Concentration of Total Suspended Particulate on X Coal Mining in Kutai Kartanegara District

Hansen, Ratna Yuliani, Deddy Alif Utama

The quality of inhaled air is determined by the amount of pollutant gases and by particulates in the air. Particulate especially total suspended particulate (TSP) contains heavy metal elements that can have serious health effects. Among all the processes that produce particulates, the coal mining process...

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Livelihoods System and Level of Vulnerability of Rice Farmer Households Due to Climate Change at Swampy Lowland in Sungai Pinang Village Banyuasin Regency

Elly Rosana, Thirtawati, Muhammad Arbi

The main problems in the development of swampy lowland are floods during the rainy season and drought in the dry season which cannot yet be predicted accurately. Climate change causes problems in swampy lowland farming. Farmers find it difficult to run their farming, especially in terms of determining...

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Risk Factor Analysis: Filariasis Events in Sembawa Public Health Center Area at Banyuasin District in 2019

Luthfia Resi Puspaningrum, Elvi Sunarsih

Banyuasin is the district with the highest number of filariasis sufferers in South Sumatra. Nearly all of the areas here are filariasis endemic, with an mRate greater than 15%. The purpose of this research, therefore, is to analyze what risk factors may contribute to increased filariasis events in...

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The Relationship Between Personal Hygiene, Environmental Sanitation, and the Nutritional Status of Toddlers Age 12–59 Months in the Settlements Wetlands

Imelda Gernaui Purba, Elvi Sunarsih, Inoy Trisnainy

Underweight among toddlers is a chronic problem in wetland settlements. The objective of this research, therefore, was to analyze the association between a toddler's personal hygiene and environmental sanitation with nutritional status. The focus on this research was on children in Ogan Ilir Regency...

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Analysis on Incidents of Helminthiasis Based on Home Sanitation of Elementary-School Children in Seluma Regency

Mario Sandro, Achmad Fickry Faisya, Rostika Flora, Mohammad Zulkarnain, Nur Alam Fajar, Samwilson Slamet

Intestinal helminthiasis is a worm infection transmitted from soil contaminated by helminths (soil-transmitted helminths). The incident of helminthiasis is commonly found in school-age children. Frequent outdoor activities, contact with soil, and poor environmental sanitation increase the incident of...

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Ammonia Exposure Among Citizen Living Surrounding Fertilizer Factory

Achmad Fickry Faisyah, Yustini Ardillah, Dini Arista Putri

Air pollution remains problem around the world. One of dangerous chemical substance is ammonia. Fertilizer factory emission is ammonia that could affect to people health. The purpose of this study was to describe ammonia effect to health among citizen living surrounding fertilizer factory. Methods: This...

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Obstacles of the Implementation of the Healthy Indonesia Program with Family Approach (PIS-PK)

Fitri Afrianti, Pujyanto

The Healthy Indonesia Program with a family approach (PIS-PK) is one of the ways for health center (puskesmas) to improve access of the community to health services by visiting families. This study aimed to describe the obstacles of PIS-PK implementation. The method used was a systematic review. We look...

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Bacteriological Quality of Water and the Occurrence of Diarrhea in Household in the Work Area of Karya Jaya Public Health Center in Palembang

Farida Kumalasari, Rico Januar Sitorus, A. Fickry Faisya

Globally, there are about 2 billion cases of diarrhea with a mortality rate of 1.5 million per year. The limited access to clean water and the poor personal hygiene in the households are the major causes of diarrheal disease through water transmission. The aim of this study is to analyse the relationship...

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Epidemiology of Pediculosis Capitis of Foster Children in Orphanages Palembang, Indonesia

Rico Januar Sitorus, Chairil Anwar, Novatria

Pediculosis capitis is the most common ectoparasites which endemic globally in developed and developing countries that have tropical and subtropical climates. Head lice are obligate blood-sucking which has the potential to cause anaemia. Itching caused by flea saliva can cause children to have a sleeping...

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Injection Drug Abuse Risky HIV Infection Among Indonesian Prisoners (Data Analysis IBBS 2015)

Sri Utami, Rico Januar Sitorus

Prisoners are one of the community groups that are vulnerable to HIV/AIDS. Prison put people in high-risk situations for the spread of HIV, because of the risky practice behavior. The purpose of this study was to analyze the effect of injection drug abuse with HIV infection among Indonesian prisoners...

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Analysis of Noise Factors in Increasing Blood Pressure of Railway Employees in Semarang Poncol Train Station

Dwi Sutiningsih, Prafista Filaely, Ari Udiyono, Emi Puji Nur Wijayanti

Noise is one of the negative impacts of the rapid development of transportation facilities in Indonesia. One of the potential means of transportation is train. Noise can affect human health, among others, can cause hearing loss, communication disorders, psychological disorders, and increased blood pressure....

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Relationship Between Obesity and Diabetes Mellitus in People Above 40 Years Old in Indonesia: A Retrospective Cohort Study, Analysis of 2007 and 2014 Indonesian Family Life Survey Data

Dita Zami Kosupa, Feranita Utama

Diabetes mellitus is one of the most common diseases in the world with an incidence increase from 151 million in 2000 to 425 million in 2017. It is estimated that in 2045, its occurrence has the tendency of increasing to 629 million cases. Also, Indonesia is among the top 10 countries with the highest...

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Risk Factors for the Incidence of Anemia in Elementary-School Children Living in Malaria-Endemic Regions

Maraden Sirait, Rostika Flora, Chairil Anwar, Mohammad Zulkarnain, Nur Alam Fajar, Achmad Fickry Faisya

Anemia is an indicator of both poor nutrition and poor health. The most common anemia caused by malnutrition is iron deficiency anemia. Helminthiasis, clinical history of malaria, nutritional status, and breakfast-eating habits are the main factors that contribute to the increased incidence of anemia...

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From Drawings to Puppet Shows: Creating a Collective Space for HIV-Positive Women: Learning from Feminist-Participatory Action Research

Najmah, Sari Andajani, Sharyn Graham Davies

Women with HIV are the real knower of their life, however, women living with HIV are highly stigmatized in Indonesia. As researchers we are, therefore, conscious of the sensitive nature of our research. The article explores the use of creative and visual methods to create a space with HIV-positive mothers...

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Relationship Between Sources of Information on Knowledge and Adolescent Attitude AT SMA N 1 Kayuagung, OKI, Sumatera Selatan

Rini Mutahar, Rini Angraini, Dewie Suranti, Siti Raesa Rahmah, Poppy Tarigan

Adolescence is a transition from childhood to adulthood. Teenagers experience rapid growth and need good nutrition to support their growth and development. One of the factors that play a role in the formation of adolescent behavior is that the cue factor acts in the form of mass media campaigns where...

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Breastfeeding Education: Its Effect on Cadres Knowledge and Attitudes of Exclusive Breastfeeding

Putri Widita Muharyani, Antarini Idriansari, Mutia Nadra Maulida, Dina Aprimilda

Posyandu cadre is an extension of health workers in educating mothers regarding breastfeeding. However, there are still many cadres who do not yet have good knowledge related to exclusive breastfeeding. This study aims to analyze the effect of breastfeeding education on the knowledge and attitudes of...

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[Determinants of Healthy Latrines Ownership in Working Area at Public Health Center of Suak Tapeh in Banyuasin Regency South Sumatra 2019](#)

Yunita Theresiana, Leni Triayana, Septa Clara

Family latrine is a building used to dispose of feces for a family that is commonly called the latrine/WC. One of the health efforts made in public is the provision of basic sanitation. One of several basic sanitation facilities in the community is latrine. This study was a quantitative study using analytical...

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[The Effectiveness of Smart Palliative Bed to Measure a Patient's Weight](#)

Khoirul Latifin, Sigit Purwanto, Dian Wahyuni

Patient safety is the most important thing in health services at the hospital. Hospital services have a high risk of patient safety, especially in providing medical care and treatment. The most common incidence of patient safety in Indonesia is the mistake of administering drugs. It needs innovation...

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[Gastric Acid Detection Device for Cancer Patients](#)

Karolin Adhisty, Mutia Nadra Maulida, Nabilla Rizki Oktadini

Management of treatment in cancer patients is still dominated by chemotherapy. Chemotherapy is a method used to reach cancer cells so that cell growth can be inhibited and controlled. Implementation of this action with side effects that can cause nausea and vomiting, thereby affecting the nutritional...

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[Development of Screening for Early Detection of Depression, Anxiety and Stress in Adolescents Based on Android Services](#)

Zulian Effendi, Sri Maryatun, Herliawati

The adolescent is a transition period from childhood to adulthood. Adolescents are often associated with problems because of the changes that occur during adolescence in the form of biological, cognitive, and social-emotional changes. Changes that occur during adolescence, making adolescents vulnerable...

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[Factors Associated with Risky Sexual Behavior in Adolescent Boys in Indonesia](#)

Harneda Noviva, Tri Yunis Miko Wahyono

According to World Organization World, adolescents are residents in the age range of 10-19 years. According to Hurlock puberty is a phase of the range of children's development changing from asexual beings to sexual beings. One of the symptoms that arise at this time is preoccupation with sex (starting...

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Effect of LIMA Discharge Planning Model on Discharge Readiness Among Patients with Diabetes Mellitus

Fitri Y. Eka Yulia, Andhini Dhona, Natosba Jum

One of the health care services for hospitalized patients is discharge planning. The main goal is maintaining continuity of advanced care at home after the patient discharge. As the chronic illness, patients with diabetes mellitus desperately need discharge planning. Effective discharge planning can...

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Relationships of Self-Efficacy, Outcome Expectation, Career Intention and Career Exploration in Nutrition Science Student's Career Choice

Fidyah Pratiwi, Rizma Adlia Syakurah, Indah Yuliana, Reynold Siburian

The international world agreed that in 2030, Sustainable Development Goals (SDGs) were goals that needed to be achieved well. Given the current focus of the world and Indonesia, especially on the issue of stunting, namely the high number of malnutrition such as low body weight and short stature. The...

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Evaluation of Iron Tablet Program Among Adolescent Girl

M. Rifki Naufaldi, Haerawati Idris

Anemia is one of the health problems throughout the world, especially in developing countries. Anemia often occurs in young women. Prevention of anemia in young women can be done by giving iron tablets. The study aimed to evaluate of iron tablet program among adolescents in the work area of Muntok Health...

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Low Birth Weight and Underweight Association in Children Aged 6–59 Months in Palembang, Indonesia: A Cross-Sectional Study

Indah Purnama Sari, Yustini Ardillah, Anita Rahmiwati

Underweight and low birth weight are important markers for The Global Nutrition Targets in 2025, expressed especially in newborns, with a 30 percent reduction in between 2012 and 2025. This study was, therefore, aimed to comprehensively analyzing the association between low birth weight and underweight,...

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Strengthening Peer Educator on Mother's Knowledge and Attitudes of Stunting in Ogan Komering Ilir Regency

Anita Rahmiwati, Feranita Utama, Indah Purnama Sari

Short children is a predictor of poor-quality human resources that are widely accepted, which in turn reduces the productive ability of a nation in the future. Stunting or malnutrition based on height by age is an indicator of chronic malnutrition. The prevalence of stunting for five-year-old infants...

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Relationship Between Characteristics of the Third-Trimester Pregnant Women and Incidence of Anemia in Malaria-Endemic Regions in Bengkulu City

Rostika Flora, Misnaniarti, Fatmalia Febry, Suci Destriatania, Ditia Fitri Arinda, Anita Rahmiwati, Agusdik, Nurlaily, Ikhsan

Background: Pregnant women who live in malaria-endemic regions are highly vulnerable to the incidence of anemia. The presence of malarial infections and pregnancy are two major causes that worsen the incidence of anemia in most women. The purpose of this study was to find out the relationship between...

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Adolescent Need to Know About Cigarettes Content

Fenny Etrawati, Yeni, Widya Lionita

Adolescents smokers are increase in prevalence. This is because the characteristics of adolescents tend to try new things which are populer among peer group without knowing the content of cigarettes and it's effects to their health. This study aimed to identify the knowledge possessed by adolescents...

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The Determinant of Chronic Energy Deficiency Incidence in Adolescent Girls in Ogan Komering, Ilir Regency

Fatmalina Febry, Fenny Etrawati, Ditia Fitri Arinda

Stunting starts from pre- conception when adolescents becomes an malnutrition and anemic mother. One problem of malnutrition in adolescents is chronic energy deficiency which will have an impact on increasing the prevalence of stunting in infants. The purpose of this study was to determine the determinant...

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The Effect of Murottal Alquran Therapy on Heart Rate, Respiration Rate, Saturation Oxygen of Premature Infants Using Mechanical Ventilation in the Neonatal Intensive Care Unit

Nurhusna, Fadliyana Ekawaty, Andika Sulistiawan

Prematurities or low birth weight commonly contributes to the mortality rate of newborns. About 35% of babies born prematurely are very vulnerable for inability to adapt to the extrauterine environment. This condition often requires intensive monitoring such as the Neonatal Intensive Care Unit (NICU)...

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The Determinant of National Health Insurance Membership in Ogan Komering Ilir District

Dian Safriantini, Haerawati Idris, Asmaripa Ainy

Membership in social security is one of the dimensions formulated by the World Health Organization in achieving Universal Health Coverage. It is also an indicator of the successfulness of the National Health Insurance (NHI) program. In the SP. Padang Subdistrict of Ogan Komering Ilir Regency, the number...

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Factors Associated with Village Midwives Performance in Antenatal Care Services, Ogan Ilir Regency 2019

Iwan Stia Budi, Ella Amalia, Afriyan Firdaus

Maternal mortality is still the main problem in Indonesia. Based on SDKI 2012, maternal mortality in Indonesia is 346 each 1000 of birth while national target in 2019 is 305 each 1000 of birth. The aim of research is to analyze factors that correlate with village midwives performance in ante natal care...

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Factors Related to Age of Menopause in Elderly Mothers in Cimanggis Community Health Center Depok

Nurmalia Ermi, Sudijanto Kamso

Women who face menopause are included in the risk group because in this group there is a drastic change in physical, psychological, and socio-cultural. The age of menopause between a woman and another woman is not the same and depends on the factors that influence it. Menopause at an earlier age will...

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Evaluation of Chronic Diseases Management Program (Prolanis)

D. Fitria Sari Firdaus, Haerawati Idris

Diabetes and Hypertension are diseases that are on the ten most diseases list in Indonesia, thus increasing health costs. The government implemented chronic disease management program (prolanis) to prevent the disease. This study aims to analyze the implementation of prolanis conducted at the Sako Health...

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Low Birth Weight and Asphyxia Neonatorum Risk: A Case-Control Study

Rahmatillah Razak, Asri Adisasmita

Asphyxia neonatorum is the cause of 23% of all neonatal mortality in the world. Three quarters from the neonatal mortality are caused by conditions that can be prevented and treated, including the incident of asphyxia. Low Birth Weight (LBW) has the risk of having a respiratory failure that can cause...

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Efficiency of Outpatient Service at Three Health Centers in Palembang City, Indonesia

Asmaripa Ainy, Iwan Stia Budi, Dian Safriantini

Background: Health center (it is called Puskesmas) is a health facility that provides basic health services through outpatient units. In an effort to improve the efficiency of outpatient services, the health center could apply the Lean Concept. The aim of this study was to analyze efficiency of outpatient...

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[The Impact of High Temperature to the Occurrence of Urine Crystallization at CV Aluminium Mandiri Palembang, South Sumatra](#)

Meta Rosalina, Yuanita Windusari

Hottest temperatures make body adapting by excreting excessive sweating. CV Aluminium Mandiri Palembang manufacture in making fan and pot that is fire furnace causing hottest temperatures. When the body loses fluid without being accompanied by the consumption of replacement fluids for a long time, it...

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[Prevalence of Unmet Needs for Family Planning and It's Reasons for Women of Reproductive Age in Ogan Ilir](#)

Yeni, Fenny Etrawati, Feranita Utama

The total birth rate of Indonesia's population in 2015 was 2.1, it is estimated that Indonesia's population in 2025 will increase to 282 million. The contraceptive method was one of the government's efforts to control the rate of population growth. The purpose of this study was to determine the prevalence...

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[Effect of Education and Provision of Drinking Water on Adolescents' Drinking Consumption and Hydration Status](#)

Ditia Fitri Arinda, Zaenal Muttaqien Sofro, Fatma Zuhrotun

Water is an essential substance for body health. A body fluid imbalance leads to dehydration, which is not only detrimental to fitness level and cognitive performance but is also related to psychological disorders and various other chronic diseases. Incidence of dehydration is higher among adolescents...

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[Association Between Lifestyle with Hypertension in Communities in Healthy at Working Area of Merdeka Health Center, Palembang City](#)

Dini Arista Putri, Amrina Rosyada, Yeni

The case of hypertension is a problem that is often not realized by the public, this disease usually begins to be detected when complications begin with other diseases. Many factors affect the emergence of this case, one of them is an unhealthy lifestyle. Unhealthy lifestyle includes smoking habit, coffee...

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[Burdens and Quality of Life of Chronic Disease Patients' Family Caregivers: A Systematic Review](#)

Jum Natosba, Fernaliza Rizona, Zulian Effendy, Adelia Pradita

Chronic illness is a disease that requires long-term treatment and care. Chronic illnesses have a big impact not only on patients but also on family caregivers which can affect the quality of life and even become a burden on family caregivers. This systematic review aims to find out the view of burdens...

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The Self-Efficacy in Hemodialysis Patients

Yosi Oktarina, Andika Sulistiawan

Hemodialysis is one of the treatments for patient with chronic renal failure. Previous study showed that the level of self efficacy could prevent complication and improve quality of life. The purpose of this study was to determine the patients' self efficacy in chronic renal failure who underwent hemodialysis...

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Mona Lestari, Novrikas, Poppy Fujianti, Nyayu Zaskia Fatturahma

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Dwi Septiawati, Inoy Trisnaini, Elvi Sunarsih, Mona Lestari, Minarti

A number of studies have found evidence to support the hypothesis that exposure to environmental tobacco smoke in pregnant women can increase the risk of impaired fetal growth. This study aims to analyze the relationship of environmental tobacco smoke exposure with the incidence of Low Birth Weight (LBW)....

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Simanjuntak Widya Linawati, Imelda Gernauli Purba

PT Pupuk Sriwidjaja Palembang produce various kinds of fertilizers Ammonia one. Primary reformer 101-B is one of process equipment in the production of ammonia with the highest temperature and pressure as well as the most at risk of failure which could result in a fire or explosion. Primary reformer...

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Feranita Utama, Anita Rahmiwati, Ditia Fitri Arinda

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Tonggo Margareta Butarbutar, Misnaniarti, Rostika Flora

The Prevention Program for Hepatitis B from Mother to Child Transmission (PMTCT) was carried out in Pangkalpinang City, Bangka Belitung Province since 2016. Pregnant women detected HBsAg positive were recorded so their newborn could get Hepatitis B Immunoglobulin (HBIG). The aim of study to analyze the...

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Hypertension is a major public health problem and important area of research due to its high prevalence and its risk factors. Factors related to hypertension are categorized into modifiable and non-modifiable risk factors. The modifiable risk factors include obesity, physical inactivity, high salt diet,...

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

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Abstract - 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 physical activity such as pregnancy exercises contribute to preventing musculoskeletal disease. The purpose of this study is to analyze the relationship of physical activity to complaints 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)***

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 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 *et al.*, 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, Karim and Utami, 2018).

RESEARCH METHOD

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. 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 100 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. Primary data were collected using the PPAQ (Pregnancy Physical Activity Questionnaire) 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. MSD complaints are categorized as yes and there are no MSD complaints.

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.

RESULTS

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
Income	
<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 no 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%.

Univariate data analysis was used to determine the frequency distribution of characteristics of pregnant women 's activities.

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 Activity

Physical Activity	Total PhysicalActivity			
	Over N	%	Normal N	%
Sedentary				
Over	36	69	16	31
Normal	17	29	41	71
Moderate				
Over	42	76	13	24
Normal	11	20	44	80
Severe				
Over	35	63	20	37
Normal	18	32	37	68
Household				
Over	21	48	22	52
Normal	32	47	35	53
Occupation				
Over	40	72	15	28
Normal	13	23	42	77
Excercise				
Over	16	55	13	45
Normal	37	46	44	54

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%.

MSDs Frequency Distribution

Table 3.3 Frequency Distribution of MSDs

VARIABLE	FREQUENCY	%
Neck		
Yes	28	25,5
No	82	74,5
Shoulder		
Yes	44	40
No	66	60
Upper arm		
Yes	5	4,5
No	105	95,5
Lower arm		
Yes	5	4,5
No	105	95,5
Hand		
Yes		
No	12	10,9
	98	89,1
Back		
Yes	5	4,5
No	105	95,5
Lower back		
Yes	91	82,7
No	19	17,3
Buttock		
Yes	28	25,5
No	82	74,5
Thigh		
Yes	7	6,4
No	103	93,6
Knee		
Yes	7	6,4
No	103	93,6
Lower limb		
Yes	7	6,4
No	103	93,6
Foot		
Yes	17	15,5
No	93	84,5

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.

Bivariate Analysis

Bivariate analysis is performed to assess the relationship or influence between independent and dependent variable.

Table 3.4 Bivariat Analysis

Variable	P value
Physical activity	0,033
Age	0,681
Education	1,000
Occupation	0,015
Income	0,076
Parity status	0,721
Chronic disease	1,000
Weight gain	1,000
Pregnancy gymnastic	0,59
Msd history	1,000

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 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.

DISCUSSION

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, Karim and Utami, 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. 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 spina 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 and 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 *et al.*, 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 and Grauer, 2008).

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 *et al.*, 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 and Hasneli, 2008).

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 and 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).

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 (Yuko *et al.*, 2017). 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 Cabeças 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 (Cabeças, 2006).

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 (Baron *et al.*, 2015).

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 and Hasneli, 2008).

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 ($p\text{-value} > 0.05$). 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 > 15 kg, 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 spondylolisthesis 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 and Grauer, 2008).

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 ($p\text{-value} > 0.05$). 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 and 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 and Hasneli, 2008).

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).

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. 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 and Grauer, 2008).

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.

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

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

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Abstract - 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 physical activity such as pregnancy exercises contribute to preventing musculoskeletal disease. The purpose of this study is to analyze the relationship of physical activity to complaints 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)

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 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 *et al.*, 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, Karim and Utami, 2018).

RESEARCH METHOD

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. 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 100 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. Primary data were collected using the PPAQ (Pregnancy Physical Activity Questionnaire) 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. MSD complaints are categorized as yes and there are no MSD complaints.

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.

RESULTS

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
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Age	
High Risk	21
Low Risk	89
Education	
Low	36
High	74
Occupation	
Housewife	56
Working	54
Income	
<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 no 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%.

Univariate data analysis was used to determine the frequency distribution of characteristics of pregnant women 's activities.

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 Activity

Physical Activity	Total PhysicalActivity			
	Over N	%	Normal N	%
Sedentary				
Over	36	69	16	31
Normal	17	29	41	71
Moderate				
Over	42	76	13	24
Normal	11	20	44	80
Severe				
Over	35	63	20	37
Normal	18	32	37	68
Household				
Over	21	48	22	52
Normal	32	47	35	53
Occupation				
Over	40	72	15	28
Normal	13	23	42	77
Excercise				
Over	16	55	13	45
Normal	37	46	44	54

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%.

MSDs Frequency Distribution

Table 3.3 Frequency Distribution of MSDs

VARIABLE	FREQUENCY	%
Neck		
Yes	28	25,5
No	82	74,5
Shoulder		
Yes	44	40
No	66	60
Upper arm		
Yes	5	4,5
No	105	95,5
Lower arm		
Yes	5	4,5
No	105	95,5
Hand		
Yes		
No	12	10,9
	98	89,1
Back		
Yes	5	4,5
No	105	95,5
Lower back		
Yes	91	82,7
No	19	17,3
Buttock		
Yes	28	25,5
No	82	74,5
Thigh		
Yes	7	6,4
No	103	93,6
Knee		
Yes	7	6,4
No	103	93,6
Lower limb		
Yes	7	6,4
No	103	93,6
Foot		
Yes	17	15,5
No	93	84,5

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.

Bivariate Analysis

Bivariate analysis is performed to assess the relationship or influence between independent and dependent variable.

Table 3.4 Bivariat Analysis

Variable	P value
Physical activity	0,033
Age	0,681
Education	1,000
Occupation	0,015
Income	0,076
Parity status	0,721
Chronic disease	1,000
Weight gain	1,000
Pregnancy gymnastic	0,59
Msds history	1,000

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 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.

DISCUSSION

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, Karim and Utami, 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. 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 spina 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 and 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 abdomini 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 *et al.*, 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 and Grauer, 2008).

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 *et al.*, 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 about 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 and Hasneli, 2008).

Relationship of Pregnant Women's Education to MSDs

2 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 and 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).

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 (Yuko *et al.*, 2017). 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 Cabeças 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 (Cabeças, 2006).

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 (Baron *et al.*, 2015).

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 and Hasneli, 2008).

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 and Grauer, 2008).

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 and 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 and Hasneli, 2008).

Relationship of Disease History to MSDs

2
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).

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 ($p\text{-value} > 0.05$). Pregnant women who have no history of MSDs are more found than mothers who have a history of MSDs. 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 and Grauer, 2008).

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 ($p\text{ value} < 0.05$) to MSDs.
5. Work is significantly related ($p\text{ value} < 0.05$) 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.

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No : 254/UN9.1.10/KKE/2019

Protokol penelitian yang diusulkan oleh :
The research protocol proposed by

Peneliti Utama : Putri Rizki Amalia Badri
Principal in Investigator

Nama Institusi : Fakultas Kesehatan Masyarakat Universitas Sriwijaya
Name of the Institution

Dengan Judul :
Title

**"ANALISIS AKTIVITAS FISIK TERHADAP RISIKO MUSKULOSKELETAL DISORDERS (MSDs)
PADA IBU HAMIL DI PUSKESMAS PLAJU PALEMBANG"**

**"ANALYSIS OF PHYSICAL ACTIVITY WITH THE RISK OF MUSKULOSKELETAL DISORDERS (MSDs)
IN PREGNANT WOMEN IN PLAJU PALEMBANG HEALTH CENTER"**

Dinyatakan laik etik sesuai 7 (tujuh) Standar WHO 2011, yaitu 1) Nilai Sosial, 2) Nilai Ilmiah, 3) Pemerataan Beban dan Manfaat, 4) Risiko, 5) Bujukan/Eksploitasi, 6) Kerahasiaan dan Privacy, dan 7) Persetujuan Setelah Penjelasan, yang merujuk pada Pedoman CIOMS 2016. Hal ini seperti yang ditunjukkan oleh terpenuhinya indikator setiap standar.

Declared to be ethically appropriate in accordance to 7 (seven) WHO 2011 Standards, 1) Social Values, 2) Scientific Values, 3) Equitable Assessment and Benefits, 4) Risks, 5) Persuasion/Exploitation, 6) Confidentiality and Privacy, and 7) Informed Consent, referring to the 2016 CIOMS Guidelines. This is as indicated by the fulfillment of the indicators of each standard.

Pernyataan Laik Etik ini berlaku selama kurun waktu tanggal 23 Juli 2019 sampai dengan tanggal 23 Juli 2020.

This declaration of ethics applies during the period July 23, 2019 until July 23, 2020.

Indralaya, July 23, 2019
Head of the Committee,

KEK FKM
Di: Rostika Flora, S.Kep., M.Kes
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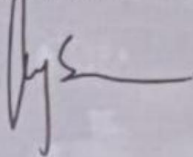
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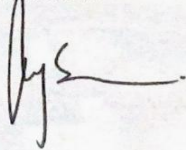
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