

DESCRIPTION OF RHEUMATOID FACTOR IN THE ELDERLY IN THE WORKING AREA OF THE NORTH TOTO HEALTH CENTER

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ABSTRACT

Rheumatoid factor (RF) is an immunoglobulin that reacts with the IgG molecule as its name indicates, RF is primarily used for the examination and monitoring of rheumatoid arthritis. Rheumatoid arthritis (rheumatism) is a disease where the immune system fails to distinguish its own tissue from foreign substances. The aim of the study was to determine the results of rheumatoid factor in the elderly in the working area of the Toto Utara Public Health Center, Bone Bolango Regency, Gorontalo Province.

The method used in this study is a descriptive qualitative approach, with primary data sources in the form of examination results *rheumatoid factor* in the serum of patients with rheumatoid arthritis in a number of 15 samples obtained using the sampling technique that is *purposive sampling*.

The results of the examination of rheumatoid factor using serum obtained in Of the 15 samples of rheumatoid arthritis sufferers aged 60 to 63 years who were positive by examining the agglutination test using the glory diagnostic kit test tool, on the results of laboratory tests, there were 4 samples (26.6%) positive for rheumatoid factor, namely 3 were female (20%) and 1 was male. male sex (6.6%).

Keywords: *rheumatoid factor, rheumatoid arthritis, elderly.*

INTRODUCTION

Elderly is an age that continues from adulthood by experiencing a physical or social mental decline that little by little until they are no longer able to carry out their daily tasks. For most people, as they get older, their ability to tolerate antigen decreases and there is an increase in reactions to self antigens [14].

The problems faced by the elderly are physical weakness, frequent inflammation of the joints when carrying out activities that are quite strenuous, the sense of vision that begins to blur, the sense of hearing begins to decrease and the body's resistance decreases, so it often gets sick. changes in the cartilage tissue in the joints become soft and experience granulation,

so that the joint surface becomes flat. The ability of cartilage to regenerate is reduced and the degeneration that occurs tends to be progressive, consequently the cartilage in joints becomes vulnerable to friction. Changes in muscle structure in aging vary greatly, decreasing the number and size of muscle fibers, increasing adipose tissue in muscles results in negative effects. Joint disorders in the elderly, the connective tissue around the joints such as tendons,

Rheumatoid factor (RF) is an immunoglobulin that reacts with IgG molecules. Because the patient also contains IgG in the serum, RF is an autoantibody. The cause of RF is not known for certain, although complement activation due to the interaction of RF

with IgG plays an important role in rheumatoid arthritis (RA) and other diseases with positive rheumatoid arthritis. Most RF is IgM, but can also be IgG or IgA [12].

Antibodies to anti-IgG are called rheumatoid factor, deposition of immune complexes in the joints will activate the classic complement pathway, causing the formation of chemoattractants that recruit macrophages and neutrophils in these places. These cells can cause tissue destruction and also spread the inflammatory response in the joint area. Inflamed cells will cause antibodies to enter the synovial cavity. The cell releases lysosomal enzymes which result in damage to the Fc portion of IgG so that antigenic determinants are formed. In response to antigenic determinants, antibodies are formed from IgG and IgM, these antibodies are called rheumatoid factor [14].

Rheumatoid arthritis is a chronic joint inflammation caused by an autoimmune disorder. Autoimmune disorders occur when the body's immune system functions as a defense against microorganisms such as viruses, bacteria, fungi, these can attack cells in the body's own tissues. Rheumatoid arthritis (rheumatism) is a disease where the immune system fails to distinguish its own tissue from objects [10].

The highest global prevalence of rheumatoid arthritis is reported in North American Native Americans at 7%. However, the prevalence of RA in the world is relatively constant, ranging from 0.5-1%. Europe is 0.62%, and America is 1.25% [11].

The prevalence of rheumatoid arthritis sufferers in Indonesia reaches 7.30%. As the number of rheumatoid arthritis sufferers increases in Indonesia, the level of awareness and misunderstanding about this disease is quite high [10].

Patients with rheumatoid arthritis who were being hospitalized in hospitals in Gorontalo province in 2019 recorded 18 patients and recorded the number of patients who died as many as 7 people [5].

Based on data from the Bone Bolango Regency service in 2018, there were 529 rheumatoid arthritis sufferers in the area which experienced an increase, then in 2019 rheumatoid arthritis sufferers decreased by 151 and in 2020 sufferers again increased by 442 [4].

Immunology is the science that studies the immune system or the immune system and a number of forms of immune system disorders. The immune system is a very complex system with multiple roles in maintaining the body's balance. Like the endocrine system, the immune system, whose job is to regulate balance, uses its components circulating throughout the body, so that it can reach targets that are far from the center. To carry out the function of immunity, in the body there is a system called the lymphoreticular system. This system is a network or collection of cells that are scattered throughout the body, for example in the bone marrow, lymph glands, spleen, thymus, respiratory system, digestive tract and several other organs. This network consists of various cells that can show a response to a stimulus according to the nature and function of each [8].

With the advances in immunology that have been achieved so far, the concept of immunity can be interpreted as a physiological mechanism that equips humans and animals with an ability to recognize a substance as foreign to itself, which then the body will take action in the form of neutralization. Eliminate or include in metabolic processes that can benefit themselves or cause damage to the body's own tissues. The concept of immunity, that first determines whether there is action by the body (immune response), is the ability of the

lymphoreticular system to recognize whether a substance is foreign or not. Stimulation of these cells occurs when the body is exposed to a substance that the cells or tissues consider foreign. This foreign configuration is called an antigen or immunogen and the processes and phenomena that accompany it are called the immune response which produces a substance called an antibody. So antigens or immunogens are potential substances that can induce an immune response that can be observed either cellular or humoral. In certain circumstances (pathological), The immune system cannot distinguish foreign substances (non-self) from substances originating from its own body (self), so cells in the immune system form anti-substances against its own body tissues. These events are called autoantibodies [8].

The body's immune reaction that can cause injury is called hypersensitivity is the basis of the pathology associated with immunological diseases. This term arises from an individual who has previously been exposed to an antigen manifests a detectable reaction to that antigen and is therefore called sensitized or becomes sensitized. Hypersensitivity results in an excessive or harmful reaction to antigens of the immediate hypersensitivity reaction type (type I hypersensitivity), injury caused by TH2 cells, IgE antibodies and mast cells and other leukocytes. Mast cells will be triggered to release mediators that act on blood vessels and smooth muscle and pro-inflammatory cytokines that recruit inflammatory cells in antibody-mediated disorders (type II hypersensitivity), Secreted IgG and IgM antibodies cause cell injury by phagocytosis or lysis and tissue injury by inducing inflammation. Antibodies can also interfere with cellular function and cause disease in the absence of tissue injury. In immune complex-mediated disorders (type III hypersensitivity), IgG

and IgM antibodies usually bind to circulating antigens and deposit antigen-antibody complexes in tissues and stimulate inflammation. Called leukocytes (neutrophils and monocytes) produce tissue damage by releasing lysosomal enzymes and generation of toxic free radicals, in cell-mediated immune disorders (type IV hypersensitivity), sensitization by T lymphocytes (TH1 cells and TH17 cells and CTLs).), causing tissue injury. TH2 cells induce the lesion part of an immediate hypersensitivity reaction and not a form of type IV hypersensitivity [21].

Autoimmunity is a phenomenon where there is a failure of a mechanism that causes lymphocytes to no longer be able to differentiate between self and non-self so that the immune system damages its own cells and tissues. Autoantibodies are antibodies that attack healthy cells and tissues in individuals with autoimmunity. This is similar to rheumatoid arthritis, where the immune system can no longer distinguish between the two and attacks the synovial tissue and other supporting tissues. Excessive inflammation is the main manifestation of this disease. Inflammation occurs due to exposure to antigens that trigger the formation of antibodies by B lymphocyte cells known as rheumatoid factor. In rheumatoid arthritis, the initial infection occurs in the joints. Inflamed cells will cause antibodies to enter the synovial cavity. These cells release lysosomal enzymes which result in damage to the Fc portion of IgG to form antigenic determinants (neoantigens). In response to neoantigens, Ab is formed from IgG and IgM. This antibody is called rheumatoid factor [22].

Metabolic factors Some hormones can affect the body's immune response, for example in hypoadrenal and hypothyroidism conditions will result in decreased resistance to infection. Likewise, people who receive treatment

with steroid preparations are very easy to get bacterial and viral infections. Steroids will inhibit phagocytosis, antibody production and inhibit the inflammatory process. Sex hormones belonging to the class of steroid hormones, such as androgens, estrogens and progesterone are thought to be modifiers of the immune response. This is reflected in the difference in the number of sufferers between men and women who suffer from certain immune diseases. environmental factors The increase in the morbidity rate of infectious diseases, often occurs in people who have a poor standard of living. The increase in infection rates may be caused by facing more germs or loss of immune system caused by poor nutritional status. Age factor Since the development of the immune system has started during pregnancy, its effectiveness also starts from a weak state and increases with age. However, this does not mean that at an advanced age, the immune system will work optimally. In fact, on the contrary, the function of the immune system in old age will begin to decline compared to younger people, even though they do not experience interference with their immune systems. This, besides being caused by the influence of biological decline, in general is also clearly related to the shrinking of the thymus gland. This situation will result in changes in cellular and humoral immune responses.

Hormones contribute to the development of autoimmunity, one of which is gender, because this autoimmune disease is usually more severe in women and also more common than in men. Due to the influence of hormones. Women have the hormone estrogen so they can encourage immune responses and increase B-cell activation by down-regulating suppressor T cells. Women have a stronger tendency to regulate inflammatory responses than men regarding a variety of antigens which can

be translated into an inflammatory response that is more about self-antigens. If the level of the hormone estrogen decreases, it may act in autoimmunity such as complaints in autoimmune diseases during fluctuations in hormonal aspects and variability, namely menstruation and pregnancy [13].

The function of the immune response includes the function of defense regarding defense against antigens from outside the body such as the invasion of microorganisms and parasites into the body. There are two possibilities that occur as a result of the resistance between the two opposing parties, namely the body can be free from harmful consequences or vice versa, if the aggressor is stronger (wins), then the body will suffer pain. The homeostatic function fulfills the general requirements of all multicellular organisms which require a uniform form for each type of body cell. In an effort to achieve this balance, normal processes of degradation and catabolism occur so that damaged cellular elements can be cleaned from the body. For example, in the process of cleaning erythrocytes and leukocytes that have expired. The surveillance function involves patrolling all parts of the body, primarily aimed at monitoring the recognition of cells that have turned abnormal through a mutation process. These cell changes can occur spontaneously or can be induced by certain chemical substances, radiation or viral infection. The surveillance function of the immune system is in charge of always being alert and recognizing any changes and then quickly disposing of newly emerging configurations on abnormal cell surfaces [14].

rheumatoid arthritis The word arthritis comes from the Greek, "arthron" which means joint, and "itis" which means inflammation. Literally, arthritis means inflammation of the joints. Meanwhile, rheumatoid arthritis is an autoimmune

disease in which the joints (usually the hands and feet) become inflamed, resulting in swelling, pain and often causing damage to the inside of the joints [15].

The classification of rheumatoid arthritis includes gouty arthritis, which is an inflammatory arthritis disease characterized by deposition of monosodium urate (MSU) crystals. Monoarthritis characterized by cardinal inflammatory red, swollen, warm, tender, and impaired function, accompanied by severe pain, tenderness / touch with sudden onset and peak in 6-12 hours, rheumatoid arthritis (AR) chronic inflammatory disease that characterized by joint swelling, joint tenderness, and synovial joint damage, which causes severe disability and premature mortality, osteoporosis is a disease characterized by decreased bone mass (bone quantity), bone tissue damage, and disturbances in bone microarchitecture (bone quality). can lead to decreased bone strength and increased risk of fracture symptoms of pain, swelling

Elderly is the term for the final stage of the aging process. Everyone will experience the process of getting old (aging stage). Aging is a condition that occurs in human life. The process of aging is a lifelong process, not only starting from a certain time, but starting from the beginning of life. Getting old is a natural process which means a person has gone through three stages of life, namely children, adults and old [19].

The impact of increasing age is the emergence of various chronic diseases, reduced organ functions including the musculoskeletal system because joint pain can reduce physical activity so that it will affect the elderly in carrying out daily activities such as eating, drinking, bathing, dressing and others. Due to the nervous system experiencing progressive anatomical changes and atrophy in the

nerve fibers of the elderly, the elderly experience a decrease in coordination and ability to carry out daily activities. The hearing system is one of the most common health problems in the elderly. Loss of hearing function can lead to social isolation, depression and withdrawal from life activities. Vision system due to decreased vision may be a big complaint for the elderly, because perceptual responses to the environment are associated with a sense of security, decreased vision (low vision) and vision function that is considered normal as the aging process decreases the eye's ability to read and color vision. The respiratory system in the aging process begins when there is a change in the connective tissue of the lungs, the total lung capacity remains but the lung reserve volume increases as compensation for the increase in lung space, so that the air flowing into the lungs decreases [2].

Some of the physiological changes in the elderly include dry skin, thinning hair, decreased hearing, decreased cough reflex, mucus discharge, decreased cardiac output. These changes are not pathological, but can make the elderly more susceptible to several diseases. Body changes continuously occur with age and are influenced by health conditions, lifestyle, stress, and the environment. Functional changes Function in the elderly includes the physical, psychosocial, cognitive, and social fields. Decreased function that occurs in the elderly is usually related to the disease and its severity which will affect the functional abilities and well-being of an elderly [18].

Clinical manifestations of complaints usually begin slowly over weeks and months. Often in the initial circumstances do not show clear signs. These complaints can be in the form of general complaints, complaints in the joints and complaints outside the joints. Common complaints of general complaints can be a feeling of

weakness, decreased appetite, a mild increase in body heat or weight loss. Joint disorders, especially regarding small and symmetrical joints, namely the joints of the wrists, knees and feet (diarthrosis joints). Other joints can also be affected, such as the elbow, shoulder, sternoclavicular, hip, ankle. Spinal abnormalities limited to the neck. Complaints often include morning stiffness, joint swelling and pain [11].

Risk factors include gender. Rheumatoid arthritis is more common in women, which is 60% of all people with arthritis are women. Rheumatoid arthritis is usually two to three times higher in women than men. Risk factors that cannot be prevented because women have an estrogen system in their bodies, women with their estrogen hormones are more likely to develop rheumatoid arthritis. Lack of estrogen hormone results in more bone destruction than bone formation. Age is the period of time since a person's existence and can be measured using a unit of time in terms of chronology, normal individuals can be seen in the degree of anatomical and physiological development. Each bone joint has a joint protective layer that prevents friction between the bones and inside the joint there is a fluid that functions as a lubricant so that the bones can be moved freely. In those who are elderly, the protective lining of the joints begins to thin and the bone fluid begins to thicken, so the body becomes painful when moved and increases the risk of rheumatoid arthritis. History of smoking the immune system (antibodies) is the body's way of protecting itself from infection and disease. Whereas smoking damages the immune system because of its carbon monoxide content, so someone who smokes is likely to experience autoimmune diseases such as rheumatoid arthritis [13].

RESEARCH METHODS

This type of research is descriptive research with a qualitative approach. The purpose of this research is to find out the results of rheumatoid factor in the elderly in the working area of the Toto Utara Public Health Center, Bone Bolango Regency, Gorontalo Province. The sampling technique used was purposive sampling, that purposive sampling is a sampling technique using certain criteria. There are 2 criteria determined by the researcher, namely inclusion criteria and exclusion criteria [20].

The type of data in this study. Researchers use Primary data was obtained from the results of rheumatoid factor examination conducted in the laboratory. The data sources in this study were obtained from questionnaires, observations and laboratory examination results.

Laboratory examination

1. Pre-Analytic

The tools used in this study were disppo/syringe, tourniquet, red cap tube, centrifuge, stir bar, slide test, clinipette. And the materials used in this study were serum, RF latex reagent, negative control, positive control, alcohol cotton, plaster, tissue, tip.

2. Analytic

a. Venous blood collection

Clean the skin with 70% alcohol cotton and let the skin dry that has been cleaned, don't hold it again, stab the vein with the needle hole position facing up. After the blood volume is considered sufficient, release the tourniquet and ask the patient to open his fist. Place the cotton at the injection site and immediately remove/withdraw the needle. Press the cotton for a few moments and then apply the plaster. Do not withdraw the needle before the tourniquet has been released [7].

b. rheumatoid factor test

The blood that has been obtained is then centrifuged for 20 minutes at 3000 rpm. Serum was examined using the latex slide method by pipetting 50 µl positive control in the first circle, and 50 µl negative control in the second circle, and 50 µl sample in the third circle in the slide test. Then 50 µl of RF Latex Reagent was added to each circle. And homogenized for 3 minutes, then observed for the presence or absence of agglutination on the test slide with a black background. The results of the observations were compared with the control.

3. Post Analytics

- a. Positive (+) agglutination occurs.
- b. Negative (-) no agglutination occurs [14].

Data analysis uses a descriptive approach to calculate percentages and then narrates, and to calculate percentages a formula for calculating percentages is used using the following opinions:

$$P = \frac{F}{N} \times 100\%$$

Information :

P = percentage number

F = Frequency measured

N = Number of all respondents

In this study the validity of the data used was the rheumatoid factor test using a qualitative method by observing the presence of agglutination in the sample used. If agglutination occurs, the sample is positive, if no agglutination occurs, the sample is negative:

RESEARCH RESULT

Table 1. Rheumatoid factor test results

Characteristics	Positive Frequency	Percentage (%)	Negative Frequency	Percentage (%)
Gender				
Man	1	6.6%	3	20%
Woman	3	20%	8	53.3%
Total	4	26.6%	11	73.3%
Age				
60 years	1	6.6%	3	20%
61 years	1	6.6%	3	20%
62 years	1	6.6%	3	20%
63 years	1	6.6%	2	13.3%
Total	4	26.6%	11	73.3%

Source: Primary data, 2022

Based on table 1 above the number of respondents who were male was 4 people (26.6%) and female was 11 people (73.3%). Based on the age category, the respondents aged 60 years were 4 people (26.6%), 61 years 4 people (26.6%), 62 years 4 people (26.6%) and 63 years 3 people (20%). Results of the rheumatoid factor examination performed. of 15 elderly people at the North Toto Health Center in 2022, the results obtained were 4 samples (26.6%) with positive results consisting of 3 women (20%) and 1 man (6.6%). And 11 negative samples (73.3%) consisted of 3 men (20%) and 8 women (53.3%). Based on the age of the positive results, the range occurs at the age of 60-63 years.

DISCUSSION

This study lasted for 20 days starting from July 25 to August 19, 2022 based on the results of a rheumatoid factor study in the elderly in the working area of the Toto Utara Health Center, Bone Bolango Regency, Gorontalo Province, found 15 samples that met the inclusion and exclusion criteria which showed agglutination and no agglutination of rheumatoid factor occurs, this examination uses a glory diagnostic kit test. This is in accordance with the opinion that the glory diagnostic kit test tool is a tool for detecting rheumatoid factor in human serum with the principle of agglutination, rheumatoid factor reagent contains latex particles coated

with human IgG. When the reagent is mixed with serum containing rheumatoid factor, agglutination will occur on the particles.

From the results of laboratory tests on 15 samples, there were 4 samples (26.6%) positive for rheumatoid factor, namely 3 women (20%) 1 man (6.6%) and 11 samples (73.3%) were negative for several factors for the development of autoimmunity, one of which was gender and age.

This study is in line with the results of Agnes and Dyah's research, from 15 samples there were 4 samples which showed a positive reaction to agglutination in human serum [1].

The reason women are more at risk of developing rheumatoid arthritis is because women have the hormone estrogen, the hormone estrogen has the potential to cause an immune system that is not good so that the immune system that should be normal becomes abnormal. Estrogen is also naturally present in the male body, but the amount is less than the level of estrogen in the female body. Hormone levels will decrease with age. A good immune system or immune system can protect us from the first time disease-causing germs enter the body, but autoimmune disease itself is a condition in which the immune system misrecognizes and attacks the body's own tissues [15].

When the immune system is exposed to substances that are considered foreign, two types of immune responses will occur, namely non-specific immune responses and specific immune responses. Although these two immune responses are different processes, it has been proven that the two types of immune responses above mutually enhance each other's effectiveness. The immune response that occurs is actually an interaction between one component and another component contained in the immune system. These interactions take place together in such a

way as to produce a rhythmic and harmonious biological activity [8].

Older people are the easiest group to suffer from health problems. The aging process will generally make bone fluids decrease so that they are brittle, hunchback, joints enlarge and become stiff, cramps, tremors, tendons contract and experience sclerosis. A decrease in bone mass is a common thing experienced by the elderly. As people get older, the strength and endurance of the person decreases, a decrease in body power to a certain level can cause a person to experience health problems, especially in the elderly. Among various health problems in the elderly, one of them is rheumatoid arthritis, hypertension, followed by other diseases [6].

Rheumatoid arthritis is a disease that does not cause death. But rheumatoid arthritis can cause several chronic diseases. The first danger of rheumatoid arthritis is that it can hinder daily activities. Rheumatoid arthritis is an incurable disease. So far, treatment is done only to reduce the symptoms and also the pain that appears alone. Because when pain due to rheumatoid arthritis appears, you will feel very uncomfortable, and will also be hampered in carrying out various activities, for example independence in carrying out daily living activities which include, ambulation, eating, dressing, bathing, brushing teeth and decorating with the aim of meeting/relating with his role as a person in the family and society. Another danger that can arise due to rheumatoid arthritis is excessive muscle and joint pain. This occurs when rheumatoid arthritis is recurring in the highest severity. This pain will appear in the joints and muscles so that it can cause excruciating pain. This will hinder movement and also force you to stop your activities [21].

CONCLUSION

Based on the results of the tests carried out, it can be concluded that from 15 samples of rheumatoid arthritis sufferers aged 60 to 63 years who were positive by examining the agglutination test using the glory diagnostic kit test tool, the results of laboratory tests were 4 samples (26.6%) positive for rheumatoid factor, namely 3 were female (20%) and 1 was male (6.6%).

REFERENCES

- [1] Agnes, A. H. dan Dyah, Y. (2012). Pemeriksaan rheumatoid faktor pada penderita tersangka rheumatoid arthritis. *Jurnal Kesmada.s*
- [2] Annisa, N. dan Alini, Putri E. S. (2020). Hubungan nyeri artritis rheumatoid dengan tingkat kemandirian pada lansia di wilayah kerja Puskesmas Kampar. *Jurnal Ners*. Vol 4. No 2. Hal 90 – 95.
- [3] Azizah dan Lilik, M. (2011). Keperawatan lanjut usia. Yogyakarta: Graha Ilmu Diakses pada tanggal 27 Juni 2022.
- [4] Dinas kesehatan Kab. Bone Bolango (2020). Jumlah kasus rheumatoid arthritis. Kabupaten Bone Bolango.
- [5] Dinas kesehatan Provinsi Gorontalo. (2022). Penderita rheumatoid arthritis rawat inap. Provinsi Gorontalo.
- [6] Fredy, A. Hamdan, N. dan Hardika. (2021). Pengalaman pengasuh dalam merawat lansia dengan penyakit kronis rematik di wilayah jangkauan lks lu mandar indonesia di desa buku. *Jurnal of Health Education and Literacy*. Vol 4. No 1.
- [7] Hanifa, F. M. dan Taufik, H. (2021). Desain workstation pengambilan sampel darah laboratorium klinik rumah sakit kelas a-b. *Jurnal sains dan seni its*. Vol 10. No 1.
- [8] Ida, B. S. (2017). Diktat imunologi dasar. Fakultas Kedokteran Universitas Udayana Denpasar.
- [9] Juli. Padila dan Andry. (2020). Tingkat pengetahuan terhadap penanganan penyakit rematoid arthritis pada lansia. *Kesmas Asclepius*. Vol 2. Hal 1-10.
- [10] Juli. Padila dan Andry. (2020). Tingkat pengetahuan terhadap penanganan penyakit rematoid arthritis pada lansia. *Kesmas Asclepius*. Vol 2. Hal 1-10.
- [11] Ketut, M. (2018). Dalam rangka menjalani kepaniteraan klinik madya di bagian ilmu penyakit dalam rsup sanglah. Fakultas Kedokteran Universitas Udayana. Hal 1-50.
- [12] Lili, A. (2019). Prevalensi hasil pemeriksaan rheumatoid faktor di UPTD Laboratorium Kesehatan Provinsi Sumatera Barat. Sekolah Tinggi Ilmu Kesehatan Perintis Padang.
- [13] Mariza, E. (2018). Gambaran faktor dominan pencetus arthritis rheumatoid di wilayah kerja puskesmas danguang danguang payakumbuh. *Akademi Keperawatan Baiturrahmah Padang*. Vol XII. No 8.
- [14] Meri dan Wulan, S. A. (2019). Analisis kesehatan dan farmasi. Rheumatoid factor pada lanjut usia. *Jurnal Ilmu Keperawatan* Vol 19. Hal 2-8.
- [15] Olson, K. R. and Nardin, E.D. (2013). *Contemporary clinical immunology and serology*. Boston: Pearson.
- [16] Puskesmas Toto Utara, (2021). Prevalensi penderita arthritis. Kabupaten Bone bolango.
- [17] Perhimpunan Reumatologi Indonesia. (2020). Buku saku reumatologi. Perhimpunan Reumatologi Indonesia
- [18] Potter dan Perry, A. G. (2009). Buku ajar fundamental keperawatan: Konsep, proses, dan praktik. Edisi 4. Vol 2. Jakarta: EGC.
- [19] Siti, N. K. (2016). Keperawatan gerontiki. Edisi 1. PPSMD Kemenkes RI. Jakarta.

- [20] Sugiyono. (2017). Metode penelitian kuantitatif, kualitatif, dan *R&D*. Alfabeta, CV. Bandung.
- [21] Wirya, S.(2017). Hipersensitifitas proses imun yang menyebabkan cedera jaringan. Patologi Anatomi Fakultas Kedokteran Unud/Rsup Sanglah Denpasar.
- [22] Zarina, A. (2016). Gambaran rheumatoid factor pada wanita lansia yang melakukan aktivitas fisik berat. Bandung: Politeknik Kesehatan Kemenkes bandung.