International Journal of Research and Review
Vol. 10; Issue: 8; August 2023
Website: www.ijrrjournal.com
Research Paper *E-ISSN: 2349-9788; P-ISSN: 2454-2237*

An Overview of Chronic Kidney Disease with Anemia at Bali Mandara Hospital in 2021-2022

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DOI: https://doi.org/10.52403/ijrr.202308118

ABSTRACT

Chronic kidney disease remains a problem in the field of nephrology, with a high incidence rate and a complex and broad etiology. Chronic kidney disease can cause several complications such as hypertension, anemia, metabolic acidosis, albuminuria, mineral and bone disorders, electrolyte imbalance, malnutrition and depression. Anemia is a condition in which the circulating mass of erythrocytes and/or hemoglobin cannot fulfill its function of providing oxygen to the body's tissues. Anemia significantly increases the risk of morbidity and mortality of chronic kidney disease. The aim of this study was to describe cases of chronic kidney disease with anemia at Bali Mandara Hospital in 2021 and 2022. This research is an observational descriptive study with a cross sectional approach, using secondary data in the form of patient medical records. Data were analyzed using SPSS software version 25 to obtain an overview of cases of chronic kidney disease with anemia based on gender, age, place of residence, degree of chronic kidney disease, degree of anemia, and anemia morphology. The results showed that most cases of chronic kidney disease with anemia at Bali Mandara Hospital at 2021-2022 were mostly experienced by men (69.0%) with the most common age range being between 46-55 years old (early elderly) of 34.5%, and the majority of chronic disease patients with anemia patients resides in the city of Denpasar (73.6%). The observed degree of severity of CKD was mostly at stage 5, accounting for 87.4%. The degree of anemia seen in patients with chronic kidney disease at Bali Mandara General Hospital was mostly moderate anemia (72.4%), with the most common morphological appearance being normochromic normocytic anemia at 75.9%.

Keywords: chronic kidney disease, anemia, anemia morphology

INTRODUCTION

Chronic kidney disease is a progressive and irreversible damage to kidney function in which the body's ability to maintain metabolism, electrolyte and equilibrium fails, leading to uremia or azotemia. This disease can be classified into stages 1 to 5 based on the decrease of glomerular filtration rate (GFR), with each increasing number indicating a more advanced stage of the disease[1]. Chronic kidney disease still remains a problem in the field of nephrology with a high incidence rate and a broad and complex etiology[2]. According to data from the IRR (Indonesian Renal Registry), reported from 249 renal units, as many as 30,554 patients were actively undergoing dialysis in 2015, the majority of whom were patients with chronic kidney failure. Chronic kidney disease increases with the aging population. In 2013, the 35-44 years old age group experienced a sharp increase in the number of people with CKD, that is 0.3%[3]. Conditions like diabetes mellitus, hypertension, smoking, heart disease, old age, long-term use of nonsteroidal anti-inflammatory drugs (NSAIDs), obesity and low socioeconomic status all are risk factors of developing CKD[4].

Chronic kidney disease can lead to multiple complications such as hypertension, anemia, metabolic acidosis, albuminuria, mineral and bone disorders, electrolyte imbalance, malnutrition and depression[5]. One of the most common complications of CKD is anemia[6-7]. Anemia is a condition in which the circulating mass of erythrocytes and/or hemoglobin cannot fulfill its function of providing oxygen to the body's tissues. Patients with anemia manifests symptoms such as lethargy, fatigue, shortness of breath at work, headaches, dizziness and muscle weakness[8]. Anemia is categorized into several types according to its etiology, namely iron-deficiency anemia, pernicious anemia, aplastic anemia, and hemolytic anemia[9]. Not only based on its etiology, anemia can also be classified based on its degree and morphology. The prevalence of anemia increases gradually as kidney function declines. There are many complications that arise when anemia occurs in CKD patients, such as erythropoietin deficiency, toxic effects of uremia on bone marrow precursor cells, reduced red blood cell life span, and increased blood loss due to capillary fragility and impaired platelet function. Anemia can also cause decreased intake, absorption, and utilization of dietary iron. Several studies also state that males have a higher chance of suffering from anemia in CKD than females. Thus, anemia in CKD worsens along with other diseases such as diabetes, cardiovascular diseases, and hypertension[10].

Anemia significantly increases the risk of morbidity and mortality of chronic kidney disease. As renal function impairment worsens in severity, there is a proportional increase in the prevalence and severity of haematological disorders[11]. Given the various types of anemia, both by the degree and morphologically, there is a broad variation of anemia that arises from CKD. Therefore, the authors would like to further discuss the profile of the degree of anemia in the form of hemoglobin concentration that occurs in CKD.

Chronic Kidney Disease

Chronic kidney disease is a progressive and irreversible damage to kidney function in which the body's ability to maintain metabolism, electrolyte and equilibrium fails which leads to uremia or azotemia. This disease can be classified into stages 1 to 5 based on the decrease of glomerular filtration rate (GFR), with each increasing number indicating a more advanced stage of the disease[1]. There are two mechanisms of damage to the kidney that lead to chronic kidney disease, namely trigger mechanisms that are specific to the underlying etiology and progressive mechanisms involving hyperfiltration and hypertrophy of the remaining living nephrons[12].

From the second mechanism, kidney function can continuously decline due to the presence of hormones such as vasoactive substances, cytokines, and growth factors that contribute to ongoing hyperfiltration and hypertrophy of nephrons[12]. There are several stages of chronic kidney disease, ranging from stage 0 to stage 5. The staging of chronic kidney disease according to glomerular filtration rate is further detailed in Table 1.

Table 1. Stages of Chronic Kidney Disease [12]

Stage	GFR mL/min/1.73m^2
0	> 90 (with risk factors)
1	>= 90 (with evidence of kidney damage)
2	60 – 89
3	30 – 59
4	15 – 29
5	< 15

In stages 1 and 2 of chronic kidney disease, there are usually no symptoms indicating a decrease in glomerular filtration rate. When entering stage 3 or 4, many symptoms will appear and become aggravating factors in the course of chronic kidney disease. In stages 3 and 4, almost all organ systems are affected, but the most prominent exacerbating factors are anemia, easily fatigued, progressive malnutrition due to abnormalities in regulating hormones affecting mineral regulation like calcium, phosphorus, and parathyroid hormone, abnormalities in homeostasis of sodium,

potassium, water, and acid-base. Finally, in stage 5 of chronic kidney disease, there is an accumulation of toxins, fluids and body electrolytes that should have been excreted by the kidneys, and when not treated can lead to uremic syndrome and death[12].

Diagnosis and Treatment of Chronic Kidney Disease

The following are several methods of diagnosing chronic kidney disease: laboratory examinations, radiological examinations, and examination of anatomical pathology tissue. Laboratory examinations include blood tests, which will show levels of creatinine or waste products in the blood, as well as urine tests, to determine the levels of albumin and creatinine in the urine and to find out the presence of blood or protein in the urine. Anatomical pathology tissue examination involves a kidney biopsy to find out signs or damage to the kidney. Radiological examinations include MRI test, ultrasound, or CT scans to see a real picture of the kidneys[13].

There are several treatment options for end-stage kidney disease, such as hemodialysis, peritoneal dialysis (in the form of continuous ambulatory peritoneal dialysis (CAPD) or continuous cyclic peritoneal dialysis (CCPD)), or transplant. However, the most common practice for most patients with end-stage kidney disease is hemodialysis[12]. Hemodialysis is a treatment that removes metabolic waste or fluids from the body. During hemodialysis, blood will be pumped to a dialysis machine or more commonly called a dialyzer. After being filtered in the dialysis machine, the blood will be returned to the bloodstream in the body. Hemodialysis can be done at home or in a hospital and is usually carried out by professional health workers. However, for at home hemodialysis it can be done by people closest to us who have previously been taught by professionals in the field of hemodialysis. Hemodialysis is usually done several times a week for four to five hours. The complications of hemodialysis are muscle cramps and hypotension[14].

Peritoneal dialysis involves the infusion of a solution containing 1.5 - 3 liters of dextrose into the peritoneal cavity. It is left for 2-4 hours to allow absorption of solutes and water from the peritoneal cavity, penetrating the peritoneal membrane into the peritoneal capillary circulation, then into the peritoneal lymph vessels and eventually into the lymphatic circulation. The two types of peritoneal dialysis have different routes in their mechanisms. In CAPD, the dialysis solution is manually infused into the peritoneal cavity during the day and exchanged three to five times a day. In CCPD, exchanges are carried out automatically at night by connecting the patient to an automatic recycler that performs a series of exchange cycles while the patient is asleep[12].

Human kidney transplantation is the treatment of choice for advanced chronic kidney disease. The donors can either be deceased or living donors. In order to perform a kidney transplant, there must be a careful selection of the recipient and donor. Within 48 hours after surgery, adequate hemodialysis must be carried out and precautions must be taken to prevent the increase of serum potassium levels, as too high levels will lead to intraoperative cardiac arrhythmias.

Anemia

Anemia is a condition in which the circulating mass of erythrocytes and/or hemoglobin cannot fulfill its function of providing oxygen to the body's tissues. However, when viewed from a laboratory perspective, anemia is defined by a condition when hemoglobin, erythrocyte count, and hematocrit reach below normal levels[8].

The classification of anemia is based on the degree of anemia and its etiophysiology. It is different in women and men, and not only that, age also has a different lower limit to be considered as anemia. Additionally, certain conditions such as pregnancy have a

lower limit as different degree of anemia compared to other women in general[8].
Based on its degree, anemia can be divided into three degrees, namely mild anemia, moderate anemia, and severe anemia. The classification according to the degree of anemia can be seen in tables 2 and 3.

Table 2. Anemia Degrees Classified Based on Age[8]

Age	Normal	Mild	Moderate	Severe
6 – 59 months	11 g/dl	10 – 10.9 g/dl	7 – 9.9 g/dl	< 7g/dl
5 – 11 years	11.5 g/dl	11 – 11.4 g/dl	8 – 10.9 g/dl	< 8 g/dl
12 – 14 years	12 g/dl	11 – 11.9 g/dl	8 – 10.9 g/dl	< 8 g/dl

Table 3. Anemia Degrees Classified Based on Gender[15]

Age	Normal	Mild	Moderate	Severe
Male	13 g/dl	11 – 12.9 g/dl	8 – 10.9 g/dl	< 8 g/dl
Female	12 g/dl	11 – 11.9 g/dl	8 – 10.9 g/dl	< 8 g/dl
Pregnant woman	11 g/dl	11 – 10.9 g/dl	7 – 9.9 g/dl	< 7 g/dl

On the other hand, the clinical criteria for anemia depend on the levels of hemoglobin, hematocrit, and erythrocytes. The criteria are as follows: hemoglobin level <10 g/dl, hematocrit <30%, and erythrocytes <2.8 million/mm3[15]. The classification is based on the etiopathophysiology and morphological characteristics of the erythrocytes. Based on the etiopathophysiology, it is classified into decreased erythrocyte production, loss of erythrocytes from the body, increased destruction of erythrocytes within the body, mixed forms, and forms whose pathogenesis is unclear[8].
In terms of the morphology of anemia, anemia can be divided into three, namely hypochromic microcytic, normochromic normocytic, and macrocytic anemia. These three types of anemia are distinguished based on the erythrocyte index in the form of Mean Corpuscular Volume (MCV) and Mean Corpuscular Hemoglobin (MCH)[8].

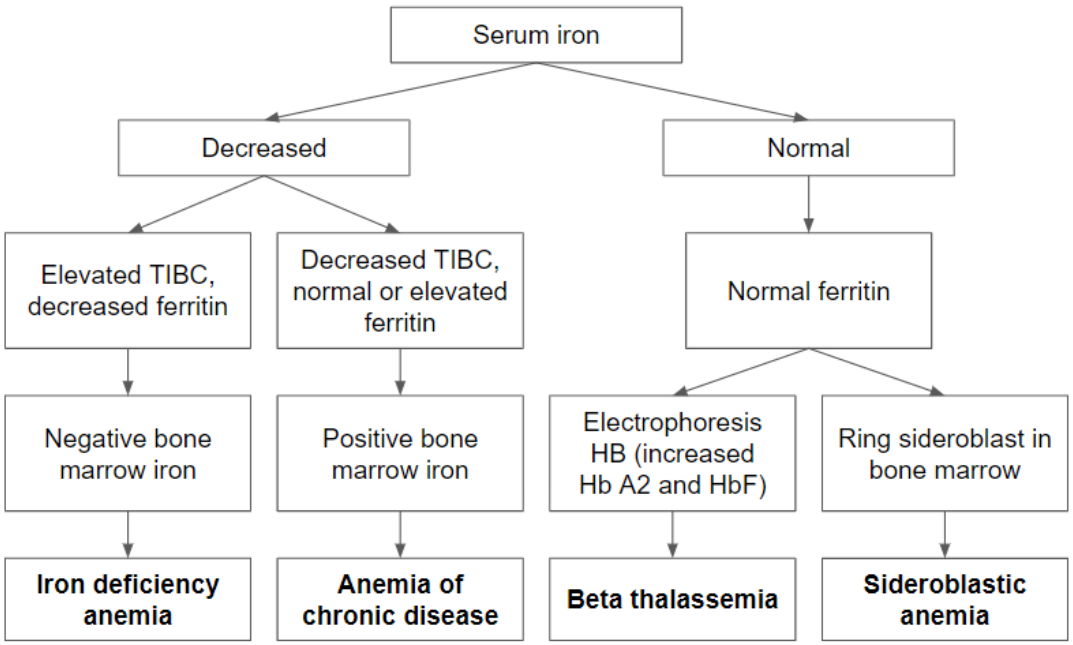

Figure 1. Algorithm for the diagnosis of hypochromic microcytic anemia[8]

Normochromic normocytic anemia is characterized by erythrocytes that have a normochromic color (normal color), and have normocytic size (normal size). It is diagnosed as normochromic normocytic anemia when the VER value is 80-95 fL,

HER >= 27pg[16]. The types of normochromic normocytic anemia are determined by several conditions which are depicted in Figure 2.

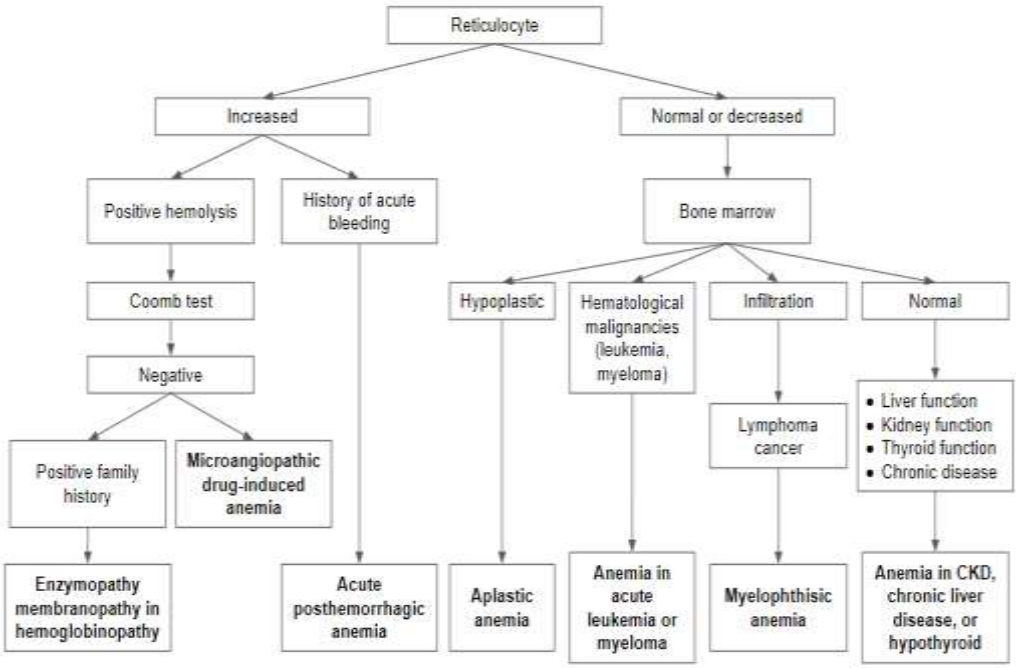

Figure 2. Algorithm for the diagnosis of normochromic normocytic anemia[8]

Macrocytic anemia is macrocytic, that is, the size of the red blood cells is large. It has a VER value of >95fL[16]. The types of macrocytic anemia are determined by several conditions which can be seen in Figure 3.

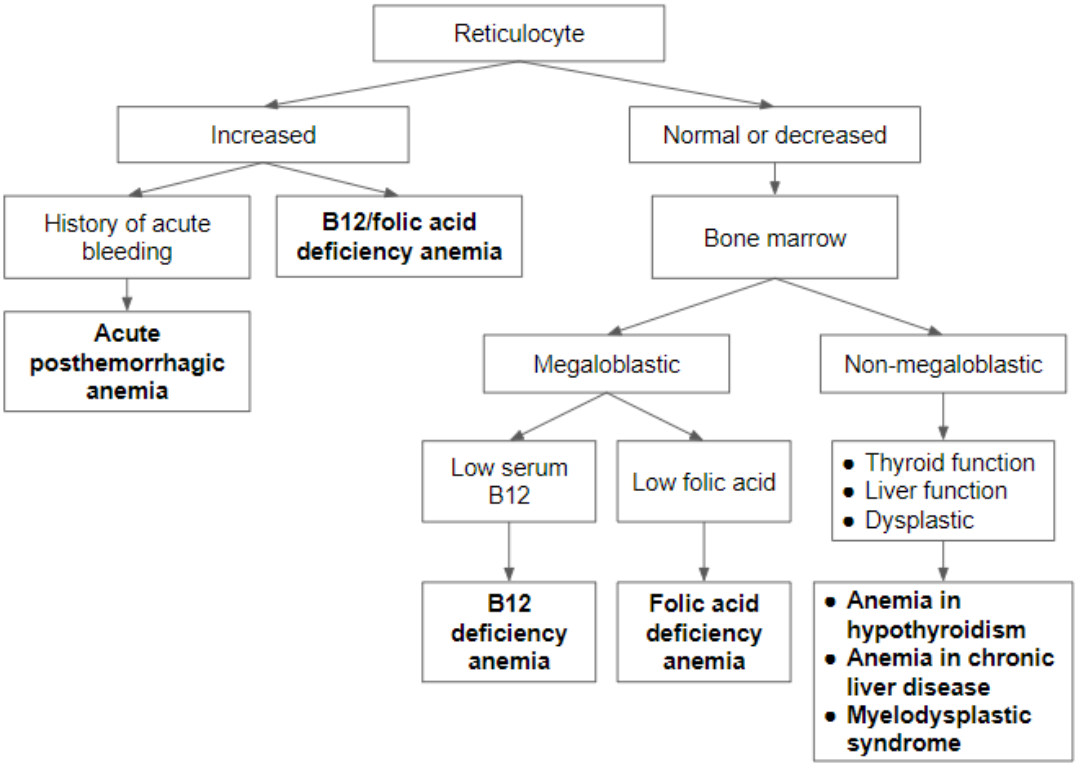

Figure 3. Algorithm for the diagnosis of macrocytic anemia[8]

Diagnosis and Treatment of Anemia

To diagnose someone suffering from anemia, several things need to be done. The first is to do an anamnesis to find out the medical history and family history, then it is necessary to do a physical examination. After that, hematological laboratory tests can be carried out, some of which include a complete blood count, Hb electrophoresis as a supporting examination, reticulocyte count, and iron examination[8-9].

The treatment of anemia is based on the type, cause, and degree. This is done in order to achieve the goal of the treatment itself, which is to increase the amount of oxygen that can be transported by the body, based on the blood Hb concentration. Chelation drugs are commonly used for lead poisoning, which is typically given to children, because children who have iron deficiency anemia have a high risk of developing lead poisoning. Recombinant erythropoietin is useful in treating anemia caused by kidney disease[17].

Anemia has many causes and it can be treated based on those causes such as following. An insufficient diet can be corrected by consuming vitamins or by increasing iron levels in the blood. Some of these vitamin supplements are vitamin B12 and folic acid, and sometimes, vitamin C[17].

If the anemia is caused by iron deficiency, non-meat foods are highly beneficial, such as green vegetables, spinach, beans, tofu, dried fruits, iron-fortified bread or cereal, and also iron supplements recommended by a doctor. Moreover, several procedures such as blood donation, surgery, and Blood and Marrow Stem Cell Transplant are available and can be considered if the patient is not using medications or certain food and beverage products[17].

Chronic Kidney Disease and Anemia

Under normal circumstances, the human body can make around 10^{12} new erythrocytes through the process of erythropoiesis[16]. When there is a decrease in the number of erythrocytes, new erythrocytes are needed to make up for the deficiency. A significant increase in the formation of new erythrocytes occurs when the body experiences hypoxia.

In anemia, the production of new erythrocytes must be increased significantly and is usually done by the body by increasing erythropoietin. Erythrocyte production requires the erythropoietin glycoprotein as the major hormone regulator. Erythropoietin, which functions as the primary hormone red blood cell formation, is produced 90% by the kidneys in peritubular interstitial cells and 10% in the liver and other locations. Previously when there were no reserves of erythropoietin, stimulation of the formation of erythropoietin occurred when there was oxygen pressure in the kidney tissue. Hypoxia will induce production of HIF-2 α and β which stimulate the production of erythropoietin. The erythropoietin gene contains elements of the HIF response. Therefore, the production of erythropoietin increases in anemia. Then, the formed erythropoiesis will be circulated by the bloodstream, and acting as a receptor in the bone marrow. The interaction of erythropoietin with its receptors on the surface of erythrocyte precursor cells in the bone marrow makes a successful erythropoietic process.

When the kidneys encounter issues like chronic kidney disease, the hormone erythropoietin may not be formed or its production may decrease. This causes no formations of new erythrocytes in the bone marrow which leads to anemia that the body could not effectively resolve[26].

Erythropoietin deficiency in CKD cannot be assessed by relying on measurements of serum erythropoietin levels. This is due to the serum erythropoietin levels may appear normal or higher than in individuals without anemia. However, erythropoietin deficiency can be seen from the description of the degree of anemia that appears. Anemia that is caused by decreased production of erythropoietin indicates a decrease in the number of nephrons in the kidney, which means a decrease in glomerular filtration

rate or an increase in the stage of chronic kidney disease[26].

MATERIALS & METHODS

The type of research used is descriptive research with a cross-sectional method. Researchers used secondary data in the form of medical records to describe cases of chronic kidney disease with anemia at Bali Mandara Hospital in 2021 and 2022. The reached population in this study was medical record data of patients with chronic kidney disease with anemia at Bali Mandara Hospital in 2021 and 2022. Samples in this study were data on patients diagnosed with chronic kidney disease with anemia recorded in the medical record report at Bali Mandara Hospital that met the inclusion and exclusion criteria.

STATISTICAL ANALYSIS

The sample collection technique used in this study was consecutive sampling. This method is the method of choice for researchers, considering that the purpose of this study is to see an overview of cases of chronic kidney disease with anemia at Bali Mandara Hospital in 2021 and 2022. This research was conducted at Bali Mandara Hospital Denpasar in May-July 2023. Using calculations using the Lemeshow formula, the minimum number of samples used in this study was 72 subjects. The data was inputted into the SPSS (Statistical Product and Service Solutions) version 25 program. The data obtained would be processed manually, analyzed descriptively, and presented in tabular form, diagrams or graphs accompanied by explanations to determine the description of chronic kidney disease with anemia at Bali Mandara Hospital in 2021 and 2022.

RESULT

The total number of patients diagnosed with chronic kidney disease with anemia in the Medical Records of Bali Mandara Hospital, Denpasar, recorded during the period 1 January 2021 – 31 December 2022, based on the inclusion criteria and exclusion criteria, was 87 people.

Overview of Cases of Chronic Kidney Disease with Anemia at Bali Mandara Hospital in 2021 and 2022 Based on Gender

Table 4. Distribution of Chronic Kidney Disease with Anemia Cases at RSUD Bali Mandara in 2021 – 2022 based on Gender

Gender	Frequency (n=87)	Percentage (%)
Male	60	69.0
Female	27	31.0

Overview of Cases of Chronic Kidney Disease with Anemia at Bali Mandara Hospital in 2021 and 2022 Based on Age

Table 5. Distribution of Chronic Kidney Disease with Anemia Cases at RSUD Bali Mandara in 2021 – 2022 based on Gender

Age	Frequency (n=87)	Percentage (%)
17 – 25 (late adolescents)	4	4.6
26 – 35 (early adults)	5	5.7
36 – 45 (late adults)	4	4.6
46 – 55 (early elderly)	30	34.5
56 – 65 (late elderly)	28	32.2
> 65 (seniors)	16	18.4

Overview of Cases of Chronic Kidney Disease with Anemia at Bali Mandara Hospital in 2021 and 2022 Based on Residence

Table 6. Distribution of Chronic Kidney Disease with Anemia Cases at RSUD Bali Mandara in 2021 – 2022 based on Residence

Age	Frequency (n=87)	Percentage (%)
Denpasar	64	73.6
Badung	14	16.1
Gianyar	4	4.6
Klungkung	1	1.1
Karangasem	2	2.3
Tabanan	1	1.1
Bangli	1	1.1

Overview of Cases of Chronic Kidney Disease with Anemia at Bali Mandara Hospital in 2021 and 2022 Based on Residence

Table 7. Distribution of Chronic Kidney Disease with Anemia Cases at RSUD Bali Mandara in 2021 – 2022 based on Stage of Kidney Disease		
Stage	**Frequency (n=87)**	**Percentage (%)**
Stage 4	11	12.6
Stage 5	76	87.4

Overview of Cases of Chronic Kidney Disease with Anemia at Bali Mandara Hospital in 2021 and 2022 Based on Degree of Anemia

Table 8. Distribution of Chronic Kidney Disease with Anemia Cases at RSUD Bali Mandara in 2021 – 2022 based on Degree of Anemia		
Degree of Anemia	**Frequency (n=87)**	**Percentage (%)**
Mild	8	9.2
Moderate	63	72.4
Severe	16	18.4

Overview of Cases of Chronic Kidney Disease with Anemia at Bali Mandara Hospital in 2018 and 2019 Based on Morphology of Anemia

Table 8. Distribution of Chronic Kidney Disease with Anemia Cases at RSUD Bali Mandara in 2018 – 2019 based on Morphology of Anemia		
Morphology of Anemia	**Frequency (n=87)**	**Percentage (%)**
Hypochromic microcytic	14	16.1
Normochromic normocytic	66	75.9
Macrocytic	7	8.0

DISCUSSION

Based on their gender, CKD with anemia patients were predominantly male, with 60 people (69.0%). These results correspond to the results of several studies that have been conducted previously. According to research conducted by Van Haalen, H. et al in 2020, after collecting data in Europe, the United States and China for three periods, it was found that the incidence of chronic kidney disease was more common in men than women, where the total male sample was 3017 individuals (57%) and female was 2259 (43%)[18]. Men are at risk of experiencing a faster decline in kidney function than women. In a study conducted by Suandewi, D., et al, the same results were obtained where the percentage of men was higher, namely 63.6%[19]. This is related to risk factors for chronic kidney disease such as smoking and drinking alcohol which are more common in men. Another research conducted by Alemu, B. et al, in 2021 found that the clinical characteristics of CKD patients were that 18% had a history of smoking before and more than 50% had a history of previous alcohol consumption[1]. This causes stress on the kidneys so that it strains their function[2].

Based on age characteristics, the majority of CKD with anemia patients were in the age range of 46 – 55 years old (early elderly), at 30 people (34.6%). These results align with previous research. One study conducted by Gunaseelan, R. et al at Sanglah General Hospital, Denpasar found that the most CKD with anemia patients fall in the 51-60 year age group, at 29 people (31%)[10]. Furthermore, previous studies have shown that there are many cases of anemia in CKD patients within the age group of 50-59 years, where the prevalence of GFR <60 ml/min/1.73 m2 is higher in the elderly compared to the younger ones. According to the National Health and Nutrition Examination Survey (NHANES), a higher prevalence rate of anemia in CKD patients was observed in US hospices aged > 64 years. At the age of 40 years, kidney filtration begins to decline at about 1% per year. This can cause anemia by the reduction of hemoglobin production[10]. This study also clearly states that when her GFR is decreased, this results in inadequate erythropoietin levels due to kidney disease,

metabolic products of renal dysfunction, and toxins produced by uremia.

Based on the characteristics of the place of residence, most patients with CKD with anemia lived in the city of Denpasar, totalling 64 people (73.6%). A similar study previously found that 212 patients (54.8%) lived in urban areas[1]. However, other studies reported different results. Sundhir, N. et al evaluated the clinical-hematological profile of anemia in CKD patients and found that it was more dominant in rural areas compared to urban areas[11]. This might be due to the location of the Bali Mandara Hospital itself in Denpasar so that more patients who come from Denpasar and patients who are outside Denpasar choose to seek treatment at the hospital near where they live.

Glomerular Filtration Rate is used to determine the severity of CKD because it can describe the function of the kidneys in filtering blood and separating it from metabolic waste and excess fluids. The worse the kidney function, the lower the person's GFR value. From this study, the severity of stage 5 CKD was obtained in 76 samples (87.4%) out of all samples (Table 7). In this specific study, there were no patients presenting with stage I, II and III CKD. In accordance with the study conducted by Dewi, N. et al at Sanjiwani Hospital, similar results were obtained, namely the severity of CKD Stage 5 of 63 samples (78.8%)[21]. Likewise, Gunaseelan, R., et al who conducted research at Sanglah General Hospital in 2020 obtained from 95 samples of CKD patients, where most of the patients had stage 5 CKD, namely 52 samples (55%)[10]. Each nephron in the kidney contributes to the glomerular filtration rate (GFR). The decline in kidney function occurs gradually and may initially appear without symptoms. The nature of renal failure depends on the etiology of the disease, but ultimately involves an initial homeostatic mechanism involving hyperfiltration of the nephrons. The kidney maintains GFR, although the nephrons undergo progressive damage as the remaining normal nephrons undergo compensatory hyperfiltration and hypertrophy. As a result, patients with mild renal impairment may show normal creatinine values, their disease may go undetected for some time[22]. In stage 5 CKD, the condition of the kidneys is almost, or if not, completely damaged and the function of the kidneys is also decreasing, even not functioning. In stage 5 of CKD, the condition of the kidneys is nearly, or if not, completely damaged, and the kidney function continues to decline, or even fail. This leads to the accumulation of fluids and electrolytes in the body which will give clinical signs in the form of swelling in the legs. The results of the 2015 study by Dixon BS regarding the survival of elderly patients with stage 5 CKD stated that stage 5 CKD patients had a better prognosis if they underwent renal transplantation therapy, but not those who were 75 years old and had high comorbidities[23].

Based on the degree of anemia, most CKD patients with anemia suffered from moderate anemia, with 72 people (72.4%). These results were consistent with the results of previous studies that have been conducted. Based on research conducted by Sanjaya, B. et al, 51.92% of patients with chronic kidney disease with anemia presented with moderate anemia. In Dewi's research at the Sanjiwani Hospital in Denpasar, it was also found that the majority of anemia in chronic kidney disease had moderate anemia, totalling at 48 people (60%)[25]. Decreased Hb levels in patients with CKD can occur due to decreased erythropoiesis, premature RBC destruction, iron deficiency, or blood loss due to hemodialysis[24].

Based on the morphology of anemia, CKD patients with anemia most commonly presented with normochromic normocytic morphology, at 66 people (75.9%). These findings also correspond to previous studies. A study by Sundhir N., et al in India found that the most common anemia morphology was normochromic normocytic in 76 people (76%)[11]. The same thing was also found in

the results of a study by Saraswati, P. et al at Sanglah General Hospital Denpasar that the most morphological features of anemia in CKD patients with anemia were normochromic normocytic, accounting for 41 people (50.6%)[25]. The morphology of normochromic normocytic anemia in CKD is caused by erythropoietin (EPO) deficiency with progressive renal dysfunction[11].

CONCLUSION

Based on the results of an overview of cases of chronic kidney disease with anemia at Bali Mandara Hospital in 2021 and 2022, the following conclusions are obtained:

1. More cases of chronic kidney disease with anemia at Bali Mandara Hospital in 2021 and 2022 are male, namely 60 people (69.0%).
2. Most cases of chronic kidney disease with anemia at Bali Mandara Hospital in 2021 and 2022 occured in the 46–55-year-old group (early elderly), namely 30 people (34.5%).
3. Most cases of chronic kidney disease with anemia at Bali Mandara Hospital in 2021 and 2022 lived in Denpasar, namely 64 people (73.6%).
4. Based on the degree of severity of chronic kidney disease with anemia at Bali Mandara Hospital in 2021 and 2022, the most frequent cases of CKD Stage 5 are 76 people (87.4).
5. Based on the degree of anemia, most cases of chronic kidney disease with anemia at Bali Mandara Hospital in 2021 and 2022 show moderate anemia, namely 63 people (72.4%)
6. Most cases of chronic kidney disease with anemia at Bali Mandara Hospital in 2021 and 2022 have the morphology of normochromic normocytic anemia, namely 66 people (75.9%).

   Further research is needed to find a relationship between increased GFR and the degree of anemia, features of chronic kidney disease and the degree of anemia and the morphology of anemia by gender. Finally, it is necessary to add characteristics to future research such as adding the characteristics of the patient's height and weight, the patient's occupation, ethnicity, and lifestyle (history of smoking and so on).

Declaration by Authors

Acknowledgement: None
Source of Funding: None
Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Alemu, B. et al. 2021.Prevalence of anemia and its associated factors among chronic kidney disease patients attending selected public hospitals of Addis Ababa, Ethiopia: Institutional-based cross-sectional study. International Journal of Nephrology and Renovascular Disease, Volume 14, pp. 67–75.
2. Yuniarti, W. 2021. Anemia Pada Pasien Gagal Ginjal Kronik. Journal health And Science: Gorontalo Journal health & Science Community. Vol 5; ISSNE:2656-9248.
3. Kementerian Kesehatan RI. 2017. Situasi Penyakit Ginjal Kronis. Pusat Data dan Informasi. Jakarta.
4. Gurgel do Amaral MS, Reijneveld SA, Geboers B, et al. 2021. Low Health Literacy is Associated with the Onset of CKD during the Life Course. Journal of the American Society of Nephrology. 2021 Jun 1;32(6):1436-1443
5. Kidney Health Australia. 2015. chronic kidney disease (Ckd) Management in General Practice. 3rd Edition. The Australian Kidney Foundation. Australia.
6. Sofue, T. et al. 2020. Prevalence of anemia in patients with chronic kidney disease in Japan: A nationwide, crosssectional cohort study using data from the Japan Chronic Kidney Disease Database (JCKD-DB). PLOS ONE. PLoS ONE 15(7): e0236132.
7. Mathias et al. 2020. Symptoms and impact anemia of chronic kidney disease. Journal of Patient-Reported Outcomes https://doi.org/10.1186/s41687-020-00215.
8. Bakta, IM. 2006. Hematologi Klinik Ringkas. 1st ed. EGC. Jakarta.
9. National Institutes of Health. 2011. Your Guide to Anemia. National Heart, Lung, and Blood Institute, National Institutes of

Health, U.S. Department of Health and Human Service.
10. Gunaseelan, R., et al. 2020. Prevalensi Anemia Pada Penyakit Ginjal Kronis dan Faktor-Faktor yang Mempengaruhinya di Rumah Sakit umum Sanglah 2015-2017. Intisari Sains Medis. Volume 11, Number 1: 248-252
11. Sundhir, N. et al. 2018. Profile of anemia in chronic kidney disease patients at a rural tertiary care centre: A prospective observational study. International Journal of Contemporary Medical Research [IJCMR], 5(5).
12. Jameson, J. dan Loscalzo, J. 2016. Harrison's nephrology and acid-base disorders,3e. McGraw-Hill Medical. New York
13. NHS Choices. 2016. Diagnosing chronic kidney disease. Gov.
14. National Kidney Foundation. 2013. Choosing a Treatment for Kidney Failure. National Kidney Foundation.
15. World Health Organization. 2011. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Department of Nutrition for Health and Development (NHD). World Health Organization. Geneva.
16. Hoffbrand, A. dan Moss, P. 2013. Kapita Selekta Hematologi. 6th ed.
17. National Heart, Lung, and Blood Institute. 2012. How Is Anemia Treated?. National Heart, Lung, and Blood Institute.
18. Van Haalen, H., et al. 2020. Impact of Chronic Kidney Disease and Anemia on Health-Related Quality Life and Work Productivity: Analysis of Multinational Real-World Data. BMC Nephrology. 21(1).
19. Suandewi, D.et al. 2020. Profil penderita CKD Stadium 5 yang Menjalani Hemodialisi Reguler di RSUD Klungkung, Bali, Indonesia. Intisari Sains Medis. Vo11, Number 2:613-619
20. Yuniarti, W. 2021. Anemia Pada Pasien Gagal Ginjal Kronik. Journal health And Science: Gorontalo Journal health & Science Community. Vol 5; ISSNE:2656-9248.
21. Dewi, N., et al. 2023. Hubungan Kadar Kreatinin dan Ureum dengan Derajat Anemia pada Pasien Penyakit Ginjal Kronik di RSUD Sanjiwani Denpasar. Aesculapius Medical Journal. Vol. 3 No.1.Februari 2023. Hal. 74 - 80
22. Lees J. et al. 2019. Glomerular filtration rate by differing measures, albuminuria and prediction of cardiovascular disease, mortality and end-stage kidney disease. Nat Med. Nov;25(11):1753-1760. doi: 10.1038/s41591-019-0627-8.
23. Chen, T.K., et al. 2019. Chronic Kidney Disease diagnosis and management. JAMA. 01; 322(13): 1294-1304.doi:10.1001/jama.2019.147745.
24. Sanjaya, B., et al. 2019. Gambaran Anemia Pada Pasien Penyakit Ginjal Kronik di RSUP Sanglah Pada Tahun 2016. Jurnal Medika Udayana. [S.l.], v. 8, n. 6, june 2019. ISSN 2303-1395.
25. Saraswati, P., et al. 2021. Gambaran Kasus Penyakit Ginjal Kronik dengan Anemia di Rumah Sakit Umum Pusat Sanglah Tahun 2018 dan 2019. Jurnal Medika Udayana. Vol.10 No.1 ISSN: 2597-8012
26. Brenner, B.M. dan Rector, F.C. 2008. Brenner & rector's THE KIDNEY. 8th ed.

How to cite this article: Dewa Ayu Agung Dwita Arthaningsih, Ida Ayu Mita Saraswati. An overview of chronic kidney disease with anemia at Bali Mandara Hospital in 2021-2022. *International Journal of Research and Review*. 2023; 10(8): 929-939.
DOI: *https://doi.org/10.52403/ijrr.202308117*

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