



Anemia decreases quality of life of the elderly in Jakarta

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ABSTRACT

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Anemia is a very common disorder both in clinical practice and in the community. The recent rise in the population of the elderly has become the focus of attention in developing countries, because of the increasing longevity of the elderly, whilst the prevalence of anemia increases with age. The objective of this study was to determine the prevalence of anemia and its association with the quality of life in the elderly. A cross-sectional study was conducted from April to June 2008, located in the Mampang Prapatan district, South Jakarta. A total of 298 elderly persons participated in this study, comprising 109 (36.6%) males and 189 (63.4%) females. Anemia was measured by the parameters of hemoglobin and quality of life was assessed by the WHOQOL-BREF instrument, a short version of the WHOQOL-100 instrument. The results of the study showed the prevalence of anemia to be 26.2%, with a higher prevalence rate in females compared with males. The quality of life in the physical, psychological, social and environmental domains differed significantly with decreasing hemoglobin levels, whereas the physical and mental quality of life declined significantly with age. Anemia is thus indicative of a reduction in the quality of life of the elderly.

Keywords: Anemia, elderly, quality of life

INTRODUCTION

Anemia is a very common disorder in clinical practice as well as in the community. Scientific advances and improved health services have resulted in an increased life span and a rise in the elderly population. The US Census Bureau has estimated that more than 36.3 million Americans are over the age of 65 years and that

this number will increase up to 85 million in the year 2050.⁽¹⁾ In 1971 the total number of Indonesian elderly was 5.3 million or 4.48% of the total population of Indonesia, in the year 2000 the number increased to 14.4 million (7.18%) and in 2020 is projected become 28.8 million (11.34%).⁽²⁾ Anemia may occur at all ages, but its prevalence rises with advancing age.⁽³⁾ According to epidemiological data, the

prevalence of anemia increases sharply at ages over 60 years. The US NHANES III (National Health & Nutrition Examination Survey) has reported that the overall prevalence of anemia in the elderly is estimated to be 10% (3.5 million), with a prevalence in males of 11% and in females of 10.2%.⁽⁴⁾ In Asia, the prevalence of anemia in Korean elderly is 13.6% and the prevalence in females (14.7%) is higher than that in males (9.9%).⁽⁵⁾

Anemia shows abnormal laboratory values, the most common parameters for defining anemia being hemoglobin levels, hematocrit and red cell count. The World Health Organization (WHO) defines anemia as a hemoglobin (Hb) concentration of <12 g/dL in females and of <13 g/dL in males.⁽⁶⁾

A number of causative factors for anemia in the elderly are i) anemia due to hemorrhage resulting from NSAID usage, malnutrition (e.g. deficiencies of iron, folic acid, vitamin B12), alcoholism, and atrophic gastritis; ii) anemia associated with chronic disease; iii) anemia of unknown origin.^(4,5) The WHO definition of quality of life (QOL) as 'an individual's perception of their position in life in the context of the culture and value systems in which they lives, and in relation to their goals, expectations, standards and concerns'. The quality of life in the elderly is assessed by the WHOQOL-100 and the WHOQOL-BREF instruments, where the last-mentioned instrument is a short version of the first.⁽⁷⁾ Several cross-sectional studies on the elderly have demonstrated an association between anemia and functional disability, reduced physical performance, decreased cognitive function and a lowered QOL as a result of declining daily activities of life.^(4,8) Although it can be hypothesized that anemia is a predictor of quality of life in the elderly, this hypothesis has to be tested by further research. The objective of the present study was to determine

the prevalence of anemia and its association with QOL in the elderly.

METHODS

Research design

In this study a cross-sectional research design was used. The study was conducted in the catchment area of the Mampang Prapatan Health Center, South Jakarta, from April to June 2008.

Study subjects

There are several definitions of the elderly. In developing countries, an individual is considered to be elderly if he or she is 60 years of age or older, whereas in developed countries an elderly is a person aged 65 years of age and older.⁽⁹⁾ The subjects of the present study were healthy elderly aged ≥ 60 years, meeting the inclusion criteria and chosen randomly from each *rukun tetangga* (RT). There were 298 elderly who participated in this study, meeting the following inclusion criteria: male or female, active, healthy, independent, able to communicate verbally and willing to participate in this study.

Data collection and assessment

Information was obtained through interviews using structured questionnaires, followed by physical examination and measurement of blood pressure and anthropometric variables. Quality of life was assessed using the Indonesian version of the WHOQOL-BREF questionnaire. This questionnaire consists of 24 items to assess 4 domains: (i) the physical health domain, consisting of 7 items, (ii) the psychological domain, consisting of 6 items, (iii) the social relations domain, consisting of 3 items, (iv) the environment domain, consisting of 8 items. The WHOQOL-BREF also contains 2 items

measuring overall quality of life and general health, bringing the total number of items to 26. A domain is not given a score if >20% of the items remain unanswered by the study subject. The assessment of quality of life by means of the WHOQOL-BREF had been validated and was of high validity.⁽¹⁰⁾ The interviewer had also gone through a standardized training course for conducting interviews and the questionnaires had been tested in a pilot study.

Measurements

Blood pressure was measured by means of a calibrated mercury sphygmomanometer. In accordance with the criteria of the Joint National Committee 7 (JNC 7) the study subjects were considered to have hypertension if the systolic pressure was ≥ 140 mmHg or the diastolic pressure ≥ 90 mm Hg⁽¹¹⁾ or if the subjects were under treatment with antihypertensive drugs. Assessment of hemoglobin (Hb), fasting glucose, total protein, and creatinine was performed in a clinical laboratory (Prodia) according to procedural standards. Anthropometric measurements comprised calculation of body mass index (BMI) by standard procedures, including measurement of height and weight. Height was measured using a portable microtoise accurate up to 0.1 cm and weight was measured by means of portable scales accurate up to 0.1 kg. From the study subjects meeting the inclusion and exclusion criteria, a 5 mL blood sample was taken by venipuncture from the cubital fossa. From each blood sample 2 mL was put into a vacutainer tube containing EDTA as anticoagulant. Hemoglobin concentration was assessed by the cyanmethemoglobin method, using a standard photometer. The remaining blood sample was centrifuged at 300 RPM for 10 minutes in order to obtain serum for the initial determinations of total protein, albumin and globulin, using a TRX 7010 automated clinical analyzer.

Ethical clearance

Ethical clearance was approved by the Research Ethics Committee of the Medical Faculty, Trisakti University. Each study subject was asked to fill in an informed consent form, legalized with affixed signature for the literate or a thumbprint for the illiterate. The identity of all study subjects was kept confidential and only used for research purposes.

Statistical analysis

Analysis of variance was performed on background characteristics, and normality of data distribution was assessed by the Kolmogorov-Smirnov test. A normal data distribution was expressed as the mean, standard deviation and percentage. Simple linear regression analysis was used to determine the association between age, hemoglobin level and quality of life of the elderly. For the statistical analysis SPSS for Windows version 15.0 was used, and $p < 0.05$ was considered statistically significant.

RESULTS

A total of 298 elderly participated in this study, consisting of 109 (36.6 %) males and 189 (63.4%) females. There were 233 subjects (78.2%) in the age group of 60-69 years and 65 (21.8%) in the age group of ≥ 70 years. The mean systolic pressure was 145.0 ± 22.9 mmHg and the mean diastolic pressure was 86.6 ± 12.4 mmHg. According to the JNC 7 criteria grade I hypertension is defined by a systolic pressure of 140-159 mmHg or a diastolic pressure of 90-99 mmHg. As judged from the mean systolic pressure, the study subjects had grade I hypertension. The BMI values were normal, with a mean of 21.7 ± 4.0 kg/m². Most laboratory parameters were within normal limits, with mean Hb of 13.2 ± 1.6 g/dL, mean fasting glucose of 117 g/dL, and mean total protein of 7.2 ± 1.1 g/

dL. However, albumin concentrations were reduced, whereas those of globulin were raised. Regarding formal education, the majority of the elderly did not finish primary school (74.4%). As to marital status, most of the elderly were widowed (54.7%), whilst 44.6% was married and 0.7% single. The overall prevalence of anemia in this study was 26.2% (78/298), with a prevalence in females of 30.2% and in males of 19.3% (Table 1).

The results of simple linear regression analysis between Hb level and the four QOL domains, viz. physical, psychological, social and environmental, showed that each rise of 1 g/dL in Hb concentration resulted in an increase in all four QOL domains in the elderly. There was a significant difference in each QOL domain due to decreased Hb. The four QOL domains, namely physical, psychological, social, and environmental, had $p=0.001$, $p=0.001$, $p=0.000$ and $p=0.001$, respectively (Table 2).

Table 3, listing the results of simple linear regression analysis between age and the four QOL domains, indicates that with advancing age there was a decrease in the four QOL domains, although a significant reduction occurred only in 2 domains, i.e. the physical ($p=0.000$) and psychological domains ($p=0.029$). For the other two domains (social and environmental) no significant difference was apparent.

Simple linear regression analysis between albumin and Hb concentrations revealed that Hb concentration was proportional to albumin

Table 1. Distribution of subject characteristics (n=298)

Characteristic	n (%)
Age (years)	
60 – 69	233 (78.2)
≥ 70	65 (21.8)
Blood pressure (mm Hg)	
Systolic (mean ± SD)	145.0 ± 22.9
Diastolic (mean ± SD)	86.8 ± 12.4
Body weight (kg) (mean ± SD)	51.9 ± 10.9
Height (cm) (mean ± SD)	154.3 ± 6.4
BMI (kg/m ²) (mean ± SD)	21.7 ± 4.0
Hb (g/dL) (mean ± SD)	13.2 ± 1.6
Fasting glucose (g/dL) (mean ± SD)	117.9 ± 61.1
Albumin (g/dL) (mean ± SD)	3.9 ± 0.6
Globulin (g/dL) (mean ± SD)	3.2 ± 0.7
Total protein (mean ± SD)	7.2 ± 1.1
Length of education	
≤ 6 years	222 (74.4)
7 – 9 years	37 (12.4)
> 9 years	40 (13.2)
Marital status	
Married	133 (44.6)
Widow/widower	163 (54.7)
Single	2 (0.7)
Prevalence of anemia	
Males	21 (19.3)
Females	57 (30.2)

concentrations, with $\hat{a} = 0.867$ and significant association ($p=0.000$). On the other hand, Hb concentrations were inversely proportional to globulin concentrations, with $\hat{a} = -0.812$ and significant association ($p=0.000$) (Table 4).

Table 2. Simple linear regression analysis between Hb level and QOL domains

	Domain			
	Physical	Psychological	Social	Environmental
	β^*	β	β	β
Hb	0.333	0.279	0.285	0.425
p	0.001	0.001	0.000	0.001

* β : regression coefficient

Table 3. Simple linear regression analysis between age and QOL domains

	Domain			
	Physical	Psychological	Social	Environmental
	β^*	β	β	β
Age (years)	-0.125	-0.62	-0.02	-0.061
p	0.000 [†]	0.029 [†]	0.928	0.138

* β : regression coefficient; [†] p<0.05: significant

Tabel 4. Results of simple linear regression analysis between albumin/globulin and Hb concentrations

	Hb concentration	
	β^*	p
Albumin	0.876	0.000
Globulin	-0.812	0.000

* β : regression coefficient

DISCUSSION

Based on the WHO criteria, the prevalence of anemia in the present study was found to be 26.2%, which was higher than in the US (10%)⁽⁴⁾ and Korea (13%). The prevalence of anemia in this study was higher in females (30.6%) than in males (19.3%), these results being not noticeably different from those of a Korean study.⁽⁵⁾

Previously, anemia of the elderly was viewed as a normal physiological process, but currently it is considered to be a pathological condition due to chronic disease or other comorbidities. In healthy elderly the Hb concentrations are similar to those of young adults,⁽¹²⁾ so that the WHO criteria for anemia can be used for defining anemia in the elderly. Anemia in the elderly is caused by various factors, such as malnutrition, nutritional deficiencies (iron, folate or vitamin B12), and acute or chronic hemorrhage (e.g. gastrointestinal hemorrhage, hemorrhage from side effects of medications). Other causes of anemia are chronic disease or inflammation, such

as renal insufficiency, congestive heart disease, hepatitis C, diabetes mellitus, rheumatoid arthritis, osteoarthritis, stroke, chronic obstructive pulmonary disease, and cancer. Anemia of unknown origin in the elderly is usually associated with abnormalities of the bone marrow, presumably because advanced age leads to decreased renal function and decreased response of the bone marrow as a source of erythropoietin.^(3,4,12) Advanced age increases the prevalence of anemia, Guralnik et al.⁽⁴⁾ reporting the prevalence of anemia to rise sharply at age 75 years and above, estimated to be 42.9%, which is higher than the prevalence of anemia at age 65-74 years, estimated at 25% .

The BMI values in the present study were normal (mean 21.7 kg/m²), but as BMI is only indicative of the total amount of body fat, it cannot be used by itself for evaluating the general nutritional status of the elderly.⁽¹³⁾ The general nutritional status is commonly assessed from body weight. An individual is said to be malnourished if there is a reduction in body weight of >10% from the initial weight within a period of 6 months or a reduction in body weight of >5% from the initial weight within a period of 3 months. A reduction in body weight of >40% from the initial weight may cause irreversible organ damage or even death.⁽¹⁴⁾

Mean systolic and diastolic pressure in the elderly was 145.0 mmHg and 86.8 mmHg, respectively, indicating that the elderly in the present study presumably had grade I

hypertension or even isolated systolic hypertension. The fasting blood glucose level of the elderly was normal, but there remains the possibility of an abnormal glucose tolerance. It is estimated that 50% of the elderly have an abnormal glucose tolerance with normal fasting blood glucose,⁽¹³⁾ which may be associated with obesity and decreased activity of the elderly. Meneilly et al.⁽¹⁵⁾ reported that at age 75 years and over an estimated 20% of the population have diabetes mellitus.

Mean albumin concentration in this study was 3.9 g/dL, indicating a low albumin level, which in turn indicates malnutrition. Serum albumin is a practical indicator for assessing malnutrition in young adults as well as in the elderly. Low serum albumin is associated with a variety of conditions, such as malnutrition, hepatic disease, proteinuria, dehydration, inflammation, and disorders of testosterone.⁽¹³⁾

With advancing age there is an increase in chronic disorders. Based on literature reports, 50-80% of the elderly aged over 65 years have on average more than one chronic disorder, whilst Yenny et al.⁽¹⁶⁾ found a figure of 68.8% for the elderly with more than one chronic disorder. The chronic disorders most frequently suffered by elderly males as well as females are musculoskeletal disorders. In addition, cardiovascular disease is a frequent cause of death and disability in the elderly. Advanced age is said to be one of the most important risk factors for musculoskeletal disorders in the elderly population. Other risk factors that also play a role are hypertension, hyperlipidemia, diabetes and obesity.⁽¹⁷⁾ In the elderly with degenerative disease there is a decreased production of erythropoietin. In patients with heart disease there is a rise in the levels of the proinflammatory cytokine IL-6 as a result of a stress-response gene expression, causing decreased erythropoietin production and response, resulting in anemia. Male hypogonadism may

induce a decreased Hb level, where administration of testosterone may raise Hb levels, because testosterone depresses IL-6 production. Testosterone increases the production of stem cells for satellite muscle cells and the hemopoetic system.^(18,19) The testosterone level also decreases with advancing age in females and plays an important role in the pathogenesis of anemia in elderly males as well as females.⁽¹⁹⁾

The majority of the elderly in the present study had minimal education, as over 50% of them merely had six years of education or less. This low educational level may have been responsible for their low economic status, which is usually associated with malnutrition (due to reduced intakes of meat, fish, eggs, vegetables, and fruit) and with poor health status, such as chronic disease, dental and periodontal disease, decreased gustation and olfaction. The use of medications such as reserpine and digoxin may be a causative factor for malnutrition in the elderly. Many elderly in the present study were also widowed (54.7%), and it is well-known that the loss of a life partner is a predisposing factor for depression in the elderly, leading to loss of appetite and subsequently malnutrition.⁽¹²⁾

In the present study there are several possible causes for the high prevalence of anemia in the elderly, viz. (i) advanced age in association with declining organ functions and decreased response of the bone marrow as a source of erythropoietin; (ii) chronic disease such as hypertension and glucose intolerance; (iii) malnutrition as assessed from the low albumin levels. Choi et al.⁽⁵⁾ reported that the most frequent causes of anemia in the elderly were chronic disease and iron deficiency due to gastrointestinal hemorrhage. The investigators also reported that gender, advanced age, low albumin, and low BMI were among the independent factors for anemia.

Simple linear regression analysis demonstrated an association between Hb level and the four QOL domains, where a rise of 1 g/

dL Hb caused an increase in the four QOL domains. A low Hb level has a negative impact on appearance, physiology and physical limitations. In the elderly aged ≥ 65 years anemia is associated with physical weakness, decreased activity, declining cognitive functions, increased risk of dementia, reduction in muscle and bone mass, increased risks of falling and increased risk of a major depressive illness.^(20,21) Similarly Lucca et al.⁽²²⁾ stated that hypoxia due to anemia affected physical functions, cognition and QOL in the elderly. Denny et al.⁽²³⁾ reported that anemia was a risk factor for loss of physical appearance and cognitive function. Chronic disease accompanied by anemia may also induce depression in the elderly, as reduced activity due to fatigue causes the elderly to become more isolated and to have fewer social and environmental interactions, which are all responsible for the decrease in the four QOL domains of the elderly. The positive clinical outcome for treating anemia, such as improved quality of life, decreased hospitalization, and decreased mortality, demand that a hemoglobin concentration of less than 12 g/aL showed be investigated and treated wherever possible.⁽²⁴⁾

The results of simple linear regression analysis between age and QOL showed that advanced age causes a significant decrease in the physical and mental domains of QOL. As reported by Canbaz et al.⁽²⁵⁾ in a study on the quality of life in the elderly, there was also a significant reduction in QOL with advancing years. With advancing age, the body of the elderly experiences a number of changes associated with the sensory organs (hearing, vision) and with the functioning of vital organs, such as the cardiovascular system, the central nervous system and the respiratory system. Advanced age is associated with decreases in anabolic hormones, which causes reduced IGF-1 levels, and also contributes to reduced lean

body mass, such that the body becomes thinner. Advanced age is accompanied by a reduction in the levels of testosterone, which plays an important role in physiological activities and affects the muscles and bone marrow.⁽¹⁸⁾ These conditions result in a decreased physical QOL in the elderly.

The changes occurring in the central nervous system with age are in the form of changes in neurotransmitter concentrations, particularly catecholaminergic neurotransmitters, which play a role in the occurrence of depression in the elderly.⁽¹²⁾ Depression is also closely associated with loss of memory and dementia. Decreased functioning of the senses of vision and hearing, dependency on others, loss of work, and reduced income are also causative factors for the occurrence of depression in the elderly. Loss of a life partner, such as is apparent from the large number of widowed elderly, may also cause depression. The ensuing depression and dementia lead to decreased psychological QOL in the elderly. The social and environmental QOL also decreased with age, but the decrease was non-significant.

Increased albumin level was correlated with increased Hb, whilst increased globulin levels caused decreased Hb levels. A high globulin level may be associated with hepatic disease, chronic infections, autoimmune disease such as rheumatoid arthritis, decreased renal functions. The results of the present study is similar to the study conducted by Alfons et al.,⁽²⁶⁾ stating that Hb level was correlated with prealbumin and albumin levels, but not with age. Several other studies also demonstrated increased albumin levels upon an increase in Hb level in patients on erythropoetin therapy.⁽²⁷⁾

The limitations of the present study are the relatively small sample size, limitations in laboratory ancillary examinations, and limitations in tracing of comorbidities of the elderly.

CONCLUSIONS

Anemia is identical with decreased QOL in all four domains. Further research is needed on the common types of anemia, and on preventive measures and management of anemia in order to enhance the quality of life of the elderly.

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