



Overview of Nutritional Status of Pregnant Women with Preeclampsia: Case Study in Aru Islands Regency, Dobo City, Southeast Maluku

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Abstract

Preeclampsia is a syndrome in terms of hypertension after 20-week pregnancy referring to a pregnant woman that previously had normal blood pressure, followed by having hypertension, proteinuria, and edema and generally occurs in the third trimester of pregnancy. Preeclampsia is one of five main causes of maternal mortality up to 12% in the world as well. This study was conducted to describe nutritional status of pregnant women with preeclampsia in Aru Islands Regency, Dobo City, Southeast Maluku. This study used mix methods, namely, quantitative and qualitative research with Case Study design. Qualitative research was to determine nutritional status of pregnant women with preeclampsia and quantitative research was to record nutrition intake of pregnant women and measure nutritional status of pregnant women with preeclampsia. Characteristics of participants with preeclampsia were more than 27 years old, worked as housewife that could be one of stress triggers and had some risk to increase preeclampsia cases because of stress that caused blood pressure increase. Preeclampsia was detected in pregnancy term of participants about 20-30 weeks according to Maternal and Child Health data. Preeclampsia risk was doubly by every increase in body weight (5-7 kg). Participants had body weight increase ranging from 8-25 kg which caused preeclampsia risk increase. Parameters of recommended dietary allowances of pregnant women including energy excess, protein deficit, fat excess, and calcium and zinc deficiency were secondary factor of preeclampsia risk increase in Aru Islands Regency, Dobo City, Southeast Maluku. *Keywords:* Nutritional Status, Pregnant Women, Preeclampsia.

Keywords: stevia leaf extract, microencapsulation, anti-diabetes

1. Introduction

Preeclampsia is a syndrome in terms of hypertension after 20-week pregnancy referring to a pregnant woman that previously had normal blood pressure and followed by having hypertension, proteinuria, edema, and generally occurs in the third trimester of pregnancy [1]. Preeclampsia is one of five main causes of maternal mortality up to 12% in the world aside from bleeding, infection, complication, old partus, and obstetric trauma. Every year, maternal mortality cases were reported from 50,000 to 70,000 cases related to preeclampsia. From age parameter, the highest number of maternal mortality cases was from 20-34 years old (67.11%) because preeclampsia was exclusively a disease for either nulliparas or reproductive women [2].

The last data from World Health Organization (WHO) in 2016 stated that prominent causes of maternal mortality cases were bleeding (28%), preeclampsia (24%), infection (11%), complication (8%), old partus (5%), obstetric trauma (5%), and obstetric emboli (3%) [3]. In accordance with Akbar MM in 2010, there were 4 risk factors of preeclampsia. The first factor was preeclampsia history; women with preeclampsia in previous pregnancy had more preeclampsia risk in upcoming pregnancy. The second factor was age; preeclampsia risk increase was nearly doubly for pregnant women aged 40 years old and more. The third factor was pregnancy gap; multiparas with 10 years of pregnancy gap had similar preeclampsia risk to nulliparas. The last factor was chronic hypertension; Chappell have researched 861 women with chronic hypertension and the results indicated that superimposed preeclampsia occurred which was shown by proteinuria in pregnant women that previously had hypertension. These incidents occurred by 22% and nearly half of those cases were early-onset preeclampsia (< 34 weeks) [4].

The case was confirmed in terms of 8,774 pregnant women with complication such as bleeding, preeclampsia, and eclampsia in Maluku. The highest percentage was from West Southeast Maluku (71.81%) and the lowest percentage was from Central Maluku Regency (9.94%). Maternal Mortality Rate (MMR) in Maluku from 2010 to 2014 fluctuated. In 2014, MMR decreased by 205 per 100,000 live birth rate. This MMR has not reached National MMR in 2015, namely, 102 per 100,000 live birth rate [5]. According to prior study by researcher in Aru Islands Regency, the data about pregnant women with preeclampsia in 2018 showed 54 cases from 579 childbirths from mild to severe preeclampsia [6].

Nutritional status of pregnant women is a balance condition in pregnant woman's body as the result of input of food consumption and nutrition usage by body to maintain functions of body organs. Food consumed by pregnant women is used to fetus' growth and development by 40% and 60% for fulfilling maternal needs. If nutrition input of pregnant women is not adequate to fulfill the needs, it possibly occurs pregnancy problems both for mother and fetus in the belly [7].

Scoring of nutritional status directly is divided into three scoring system, namely, food consumption survey using food recall, vital statistic, and ecology factor. Moreover, scoring of nutritional status of pregnant women can be conducted by using biochemical and anthropometry measurement. Biochemical scoring is a nutrition scoring of blood and urine and it can detect early nutrition deficiency. Anthropometry scoring is a basic knowledge regarding comparison of size of human body such as height, weight, body fats, etc. [8].

Obesity is a risk factor of preeclampsia and the risk comes more severe along with Body Mass Index (BMI) increase. Preeclampsia risk increases doubly every increase of weight by 5-7 kg/m². Preeclampsia risk increase is potential to increase in line with BMI increase. Women with BMI > 35 before pregnancy have fourfold

potency of preeclampsia rather than women with BMI ranging from 19-27 kg/m² before pregnancy [9].

In Journal "Hubungan Antara Jarak Kehamilan dan Status Gizi dengan Kejadian Preeklampsia pada Ibu Hamil di RS Aura Syifa Kabupaten Kediri Tahun 2015", 48 pregnant women were in normal nutritional status without preeclampsia (56.5%), 19 women were in normal nutritional status with mild preeclampsia (22.4%), and 3 women were in normal nutritional status with severe preeclampsia (3.5%). Therefore, this indicated that the more number of pregnant women with normal nutritional status were, the less possibility of preeclampsia occurred. However, pregnant women with normal nutritional status could have preeclampsia because of other factors [10].

In accord with previous explanation and supported by MMR data in Maluku in 2015, it has not reached national MMR as the target. Furthermore, high number of preeclampsia cases constantly occurred, thus, researcher was interested in observing overview of nutritional status as one of risk factors of preeclampsia in Dobo City, Southeast Maluku.

2. Experimental section

This study used mix methods including quantitative and qualitative method with Case Study design which means a method or strategy in study to solve the case. Qualitative method was used to identify overview of nutritional status of pregnant women with preeclampsia. Quantitative method was used to record food consumption of pregnant women with preeclampsia. Researcher identified nutritional status of pregnant women with preeclampsia as well [11]. This study was conducted from September 2019 to January 2020 in Dobo City, Southeast Maluku.

Participants in this study were pregnant women in the third trimester with preeclampsia in Dobo City, Aru Islands Regency. Population of pregnant women in Cendrawasih Dobo Regional Public Hospital were 23 persons and

participants as sample were 5 pregnant women with preeclampsia that fulfilled the requirement by different characteristics such as nulliparas, multiparas, patients with high blood pressure history before pregnancy, participants from three different tribes, different educational background, different occupation, and different age. Primary data collection was done by structured/focused interviews by participants were interviewed to answer the questions [11]. Researcher used interview guidelines containing participants' characteristics, preeclampsia history, pregnancy term, pregnancy gap, multipara, and chronic hypertension history. Questionnaires were used by using food recall 3 x 24 hours to identify nutritional status of participants. Researcher used secondary data from Maternal and Child Health book including blood pressure, height, BMI before pregnancy, and weight addition during pregnancy.

Data collection results were checked by using member check and data triangulation. Member check was conducted with participants to identify further the data. Data triangulation was done with health workers and participants' family.

All data were tabulated by using analysis technique. Univariate was used to recognize the overview and describe the results about variables of nutritional status that were presented in percentage form and table from. Analysis technique used Miles and Huberman model including data reduction, data visualization, conclusion, and verification [11].

3. Results and Discussion

The data were collected for two months from 20 November 2019 to 18 January 2020 in Aru Islands Regency, Dobo City, Southeast Maluku. Data collection and interviews used five participants in Cendrawasih Dobo Regional Public Hospital and data triangulation was used for nurses or midwives in polyclinic of Cendrawasih Dobo Regional Public Hospital and participants' family.

3.1. Characteristics of participants

Referring to Table 1, it displays that age of participants with preeclampsia ranged from 27-39 years old. According to study by Erma. 2018, it stated that preeclampsia generally occurred to pregnant women aged > 35 years old and frequently in early and late reproductive age. Pregnant women aged < 20 years old usually tended to be easier in having blood pressure increase and spasm. In contrast, pregnant women aged > 35 years old were susceptible in blood pressure increase, thus, the proper age for pregnancy was 20-35 years old [12]. Those results were in line with the results in this study which presented that participants with preeclampsia in Cendrawasih Dobo Regional Public Hospital from 35-39 years old had preeclampsia dominantly.

Education is a learning process to develop and level up knowledge and one of the factors that can influence somebody's perception. Educational stage determines easiness of somebody to absorb and understand knowledge that they have obtained. In general, the higher educational stage of somebody is, the richer knowledge of somebody is [13]. According to Table 1, all participants have finished their education up to either Senior High School or Bachelor, therefore, participants' knowledge has been in proper stage. Nonetheless, participants have never acquired particular education related to preeclampsia from both primary health center and health services, thus, it caused participants' knowledge related to dietary habit, healthy style, and other factors in terms of preeclampsia was extremely less *"There is no particular diet during pregnancy, I eat all food. There is no suggestion from healthcare team to have diet particularly regarding the food I am not permitted to consume"* (P5). The study by [14] indicated that mothers' knowledge of preeclampsia was highly important because nearly 50% of mother and fetus mortality was caused by preeclampsia, thus, it was essential for pregnant women to achieve preeclampsia information as early as possible. The results were in line that education

and health promotion by health services for participants in terms of preeclampsia should be conducted to enrich the knowledge.

In accord with Table 1, occupation of three participants was governance employee and two participants was housewife. The results of the study by [15] stated that characteristics of preeclampsia patients based on the occupation implied that patients from housewife group were dominant in mild preeclampsia by 11 persons (18.3%) and severe preeclampsia by 24 persons (40%). This statement was supported by [16] denoted that preeclampsia cases were dominated by housewives at 63.5% because occupation was associated with physical activities and stress as risk factors of preeclampsia. Stress could cause Corticotropic-Releasing Hormone (CRH) discharged by hypothalamus, thus, it triggered heart to pump blood faster and it caused blood pressure increase [17]. It was in line with the study results that housewives tended to have more stress because they had to work at home, manage gardening harvests, and do the chores.

Participants with pregnancy term ranging from 36-40 weeks were taken to be sample as the third trimester participants. There was numerous study discussed about the relationship between pregnancy term and preeclampsia cases. The study conducted by [18] presented that most of pregnant women with preeclampsia were in pregnancy term for 36-42 weeks (74.71%). Preeclampsia frequently came in pregnancy term more than 20 weeks. It was caused by activeness of placenta work to deliver nutrition to fetus, therefore, it caused blood pressure increase as the reaction of organ metabolism increase in mother's body. This study was in line with previous study which indicated that there was significant relationship between pregnancy term and preeclampsia cases of pregnant women in Inpatient Unit of Midwifery and Obstetric Disease in Dr. Mohammad Hoesin Palembang Central Public Hospital in 2009 which implied that the longer pregnancy term was, the higher frequency of preeclampsia case was [18].

Table 1. Characteristics of pregnant women participants with preeclampsia

Participant code	Age	Religion	Tribe	Educational background	Occupation	Pregnancy term	Gravida
P1	27	P/C	Tanimbar	Bachelor	U/E	40 weeks	1
P2	38	P/C	Aru	Bachelor	Civil servant	39 weeks	1
P3	39	P/C	Tepa	SHS	U/E	38 weeks	5
P4	37	P/C	Aru	SHS	Housewife	38 weeks	2
P5	35	P/C	Aru	SHS	Housewife	36 weeks	3

Information: P/C = Protestant Christian; SHS = Senior High School; U/E = Unofficial employee

Table 2. Nutritional status of pregnant women with preeclampsia

Participant code	BMI before pregnancy	Height (cm)	Weight before pregnancy (kg)	Nutritional status	Weight during pregnancy (kg)	Weight increase during pregnancy (kg)	Standard of weight increase of pregnant women (CDC)*	
							Obesity	Normal
P1	18.3	160	47	Under-weight	72	25	>7-11.5kg	
P2	17.7	150	40	Under-weight	60	20	>7-11.5kg	
P3	22.3	161	56	Normal	79	21	>5-9kg	
P4	19.5	155	47	Normal	55.7	8.7		<11.5-16kg
P5	18.9	154.2	45	Normal	53	8		<11.5-16kg

Information: CDC = Center for Disease Control; * = during pregnancy

3.2. Nutritional status of pregnant women with preeclampsia

Body Mass Index (BMI) before pregnancy was used as guidelines of nutritional status of women before pregnancy and to determine optimal weight increase during pregnancy. In addition, weight increase during pregnancy was an indicator to determine nutritional status of mothers. If BMI was 18.5 – 24.9 (normal), it was ideal BMI, then, weight increase during pregnancy suggested was 11-16 kg. In the first trimester, weight increase of pregnant women normally was 0.5 - 2.5 kg and usually followed by upcoming weight increase by 0.5 kg per week [19]. The results according to nutritional status (BMI), weight increase during pregnancy, and food recall represented that BMI with obesity status was more dominant. Participants with obesity status and mild and moderate preeclampsia were three persons (60%). Participants in this study had weight increase by 21-25 kg because their dietary habit was uncontrolled as one of participants' statement "My eating frequency is 4-5 times per day. My daily food is white rice, fish, and vegetables. Every

night, I eat meat, pickles, ketupat, and instant cold beverage" (P1). According to ([15], preeclampsia risk occurred threefold for women with obesity because obesity caused cholesterol increase in blood and heart had to work harder. It can be seen from the results that three participants previously had underweight nutritional status (P1, P2), normal nutritional status (P3) and had obesity during pregnancy, then, it caused the risk of blood pressure increase.

In accordance with Table 3, it presents that distribution of participants based on macro and micro nutrition intake was: two participants (40%) with over energy intake by 1.54% - 1.56%, two participants (40%) with mild deficit of protein intake by 0.86% - 0.89%, one participant (10%) with over protein intake by 1.30%. For fat intake, all participants (100%) had over fat intake by 1.40% - 3.21%, one participant (10%) with severe deficit of carbohydrate intake by 0.57%, three participants (80%) with moderate deficit of carbohydrate intake by 0.70% - 0.77%, one participant (10%) with under iron intake by 0.73%, five participants (100%) with under calcium intake by 0.19% - 0.49%, two

participants (40%) with under zinc intake by 42% - 73%, and five participants (100%) with under sodium intake by 0.01% - 0.03%.

The results indicated that over energy intake of pregnant women with preeclampsia (>110% RDA) was a risk factor of preeclampsia cases. In accord with (Masrikhiyah, 2018), participants with over energy intake (>110% RDA) had the risk 3,068 times to have preeclampsia rather than participants with adequate energy intake. This study was supported by Clausen et.al. (2001) as well which

stated that in Norway (population-based), cohort study of pregnant women was conducted in early term of the second trimester using quantitative Food Frequency Questionnaire (FFQ) and discovered that energy intake > 3,350 kcal/day had the risk 3.7 times to have preeclampsia. It supported the data in this study that among five participants in this study, two participants had over energy intake by 154% - 156% and they had preeclampsia as explained before.

Table 3. Calculation of recommended dietary allowances of pregnant women with preeclampsia

Dietary parameter	allowance Category	Amount	Percentage
ENERGY	Severe deficit = <70% RDA	Normal = 3	1.05% - 1.12%
	Moderate deficit = 70-79% RDA	Over = 2	1.54% - 1.56%
	Mild deficit = 80-89% RDA		
	Normal = 90-119% RDA		
	Over = 120% RDA		
PROTEIN	Severe deficit = <70% RDA	Mild deficit = 2	0.86% - 0.89%
	Moderate deficit = 70-79% RDA	Normal = 2	0.97% - 1.12%
	Mild deficit = 80-89% RDA	Over = 1	1.30%
	Normal = 90-119% RDA		
	Over = 120% RDA		
FAT	Severe deficit = <70% RDA	Over = 5	1.40% - 3.21%
	Moderate deficit = 70-79% RDA		
	Mild deficit = 80-89% RDA		
	Normal = 90-119% RDA		
	Over = 120% RDA		
CARBOHYDRATE	Severe deficit = <70% RDA	Severe deficit = 1	0.57%
	Moderate deficit = 70-79% RDA	Moderate deficit = 3	0.70% - 0.77%
	Mild deficit = 80-89% RDA	Normal = 1	1.92%
	Normal = 90-119% RDA		
	Over = 120% RDA		
IRON	Under = <77% RDA	Under = 1	0.73%
	Adequate = 77% RDA	Adequate = 4	0.89% - 1.75%
VITAMIN C	Under = <77% RDA		
	Adequate = 77% RDA	Adequate = 5	1.14% - 2.40%
CALSIUM	Under = <77% RDA	Under = 5	0.19% - 0.49%
	Adequate = 77% RDA		
ZINC	Under = <77% RDA	Under = 2	42% - 73%
	Adequate = 77% RDA	Adequate = 3	89% - 136%
SODIUM	Under = <77% RDA	Under = 5	0.01% - 0.03%
	Adequate = 77% RDA		

Information: RDA = Recommended Dietary Allowances

Participants with mild deficit of protein intake were two persons, normal protein intake were two persons and over protein intake was one person. According to (Cunningham, Leveno and Bloom et.al, 2010) in [20], under protein intake of pregnant women could trigger

hypoproteinemia, serum albumin decrease, and endothelial tissue transformation. Disturbance of endothelial tissue regeneration could cause vascular abnormality with clinical manifestation including high blood pressure, proteinuria, and edema. It was commonly one of

the factors of preeclampsia cases. In addition, over protein concentration in blood could trigger preeclampsia to pregnant women. Therefore, it was truly important to control protein concentration in blood during pregnancy especially for participants with preeclampsia. Furthermore, four of five participants rarely consumed food that contained protein such as chicken, egg, almond, cheese, yoghurt, except fish as participant's statement *"My daily food is rice, fish, kangkung vegetable, cassava leaves, banana blossom, and soup"* (P2) and *"As usual, my fixed food is white rice, papeda, cassava, fish, squash vegetable, kangkung, and spinach"* (P5), thus, it could be a cause of protein deficit to pregnant women.

Table 3 illustrates that all participants had over fat intake by 140% - 321% that caused preeclampsia because of atherosclerosis and blood vessels constriction (hypertension) (Ujan, 2012). According to [21] in their study, it stated that women with fat increase had preeclampsia doubly rather than women with normal weight. Preeclampsia risk increased doubly for every increase of weight (5-7 kg), thus, it summarized that participants in this study had weight increase ranging from 8-25 kg that caused preeclampsia risk increased as well. Preeclampsia risk increase was influenced by BMI increase. For obese people (obesity), there were some damage in their bodies such as insulin resistance, inflammation increase, dyslipidemia, and other impacts that would affect asymmetric dimethylarginine (ADMA) increase and preeclampsia [21].

In accord with Table 3, it denoted that participants with severe carbohydrate deficit was one person, moderate deficit were three persons, and normal status was one person. It was because participants with obesity status limit their food intake to maintain their weight as they concerned childbirth process and also lacked of proper education about dietary limitation for preeclampsia patients as one of participants' statement *"I was asked by nurse to maintain my weight because it can complicate childbirth process, that is why I tend to drink more mineral water and eat fruits if available"*

(P2). It was confirmed by nurse's statement *"Yes, it is true. We recommend to limit all seafood except fish because patient has high blood pressure, then, I suggest to maintain weight and dietary habit"*. Furthermore, there was one participant with under iron intake. Iron deficiency could be potential to anemia, oppositely, there was no complaint from participants related to fatigue or other anemia symptoms during interview.

Referring to Table 3, all participants had calcium deficiency because four of five participants did not obtain calcium tablets from health service, one of them had never followed instruction from primary health center except from obstetrician and did not consume calcium tablets previously *"I do not consume calcium tablets or anything else. I just take medicine to blood addition as a recommendation from my sister because she is a nurse"* (P1) that was supported by somebody's statement in health service *"Here, calcium tablets are rarely available, thus, patients usually only obtain iron tablets during pregnancy"* (PR5). According to some previous study, in addition to age factor, parity and preeclampsia history in previous pregnancy could be the causes of preeclampsia. There was a statement that nutrition took a part of preeclampsia cases. This study implied that calcium supplements intake of women with low calcium status could protect body from preeclampsia. The data supported the hypothesis that deficiency of calcium supplements intake could increase preeclampsia cases [22]. It was in line with the study results that calcium deficiency could be supporting factor of preeclampsia cases in Cendrawasih Dobo Regional Public Hospital.

It can be seen from Table 2 that two of five participants had zinc intake deficiency. Zinc acted as antioxidant related to risk factor of preeclampsia. Low zinc concentration in serum of pregnant women could create imbalance between free radicals and antioxidants and caused preeclampsia based on oxidative stress theory [23]. The number of scientific research related to this topic should be conducted, therefore, it can provide strong fundamental

about zinc concentration in serum of pregnant women with preeclampsia.

In addition, Table 3 displays sodium intake as one of the important keys. According to interview results with participants, there was only one participant that obtained education about particular diet, namely, participant with hypertension history before pregnancy. Nonetheless, all patients did not obtain particular dietary suggestions to limit salt consumption during pregnancy after understanding their condition.

During interview with participants, researcher identified that participants have limited salt consumption for a long time, thus, the result of sodium averagely was in under status as somebody's statement in health service that *"Yes, patients have been asked to maintain weight and reduce salt consumption. Moreover, there is a plan to C-section operation for childbirth"* (PR2). Nevertheless, in accordance with the study of (Febriana Ella, Rahfiludin M. Zen, 2017), it stated that there was no relationship between sodium and blood pressure. It was possibly because there was limitation in this study, namely, average of sodium intake of participants which was sodium intake only came from foodstuff and food from self-cooking without inputting total of sodium of participants before consuming food, thus, further study related to this topic is certainly required to understand more and obtain more valid results.

4. Conclusion

Overview of nutritional status of pregnant women with preeclampsia about recommended dietary allowances of them including energy excess, protein deficit, fat excess, calcium and zinc deficiency are supporting elements of preeclampsia risk increase in Aru Islands Regency, Dobo City, Southeast Maluku.

Acknowledgement

Thank to RSUD Cendrawasih Dobo for accepting to collect data.

Conflict of Interest

The authors declare there is no conflict of interest.

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