Helminthiasis and Factors Affecting the Nutritional Status of Pregnant Women at Karang Anyar Health Center, Jati Agung, South Lampung

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Nutritional status in pregnancy is needed for fetal growth and development. Insufficient nutrition has the risk of causing Chronic Energy Deficiency (CED). The CED rate among pregnant women in Indonesia is 17.3% and in Lampung Province it is 13.6%. Nutritional status is influenced by nutritional intake and helminthiasis infection. Apart from that, there are other factors such as social determinants of health, namely economics, education, employment and age. This research uses a cross-sectional research design. The research sample was 86 pregnant women. Data collection was carried out using a questionnaire, measurement of Upper Arm Circumference (MUAC), and examination of feces using the formol ether sedimentation method. Bivariate analysis used chi square, Fischer, and Mann Whitney. The results of the study showed that there was a significant relationship between helminthiasis (p = 0.009), education (p = 0.023), and per capita income (p < 0.001) with the nutritional status of pregnant women. Meanwhile, for other variables (knowledge about helminthiasis, preventive behavior, age, and occupation) there was no significant relationship (p > 0.05). Helminthiasis and Factors Affecting the Nutritional Status of Pregnant Women in Karang Anyar Health Center, Jati Agung, South Lampung Regency.

Key word: helminthiasis, social and health determinant

INTRODUCTION

Pregnancy is a physiological process crucial for intrauterine fetal growth and development [1]. Adequate maternal nutrition during pregnancy is essential for both maternal health and fetal well-being. Insufficient nutrition increases the risk of malnutrition and, in the long term, chronic energy deficiency (CED) [2]. CED during pregnancy is associated with higher risks of fetal growth restriction, miscarriage, congenital anomalies, neonatal anemia, neonatal mortality, and low birth weight (LBW) [3]. In Indonesia, the prevalence of CED among pregnant women is 17.3%, while in Lampung Province it is 13.6%. Specifically, in South Lampung, severe energy deficiency (SEZ) affects 9.56% of pregnant women [4].

The nutritional status of pregnant women is influenced by various factors, including dietary intake and chronic infections such as helminthiasis [5]. Soil-transmitted helminth (STH) infections, such as Ascaris lumbricoides, Trichuris trichiura, Necator americanus, and Ancylostoma duodenale, significantly affect nutritional status because feeding on blood, vitamins, and nutrients, leading to malabsorption and reduced appetite [6]. In Indonesia, the prevalence of helminth infections was alarmingly high at 62% in 2017 [7].

Social determinants of health, such as economic status, education, employment, and age, also influence CED risk among pregnant women. Women with better economic conditions are able to access higher-quality and more diverse foods, thereby improving their nutritional status [8]. Younger pregnant women (<20 years) or older (>35 years) face unique nutritional challenges due to their growth and aging processes, respectively [9]. Additionally, maternal knowledge and behaviors regarding nutrition and infectious disease prevention play indirect but significant roles in nutritional outcomes [5].

This study investigates several factors influencing the nutritional status of pregnant women in the Karang Anyar Community Health Center's catchment area of Jati Agung District, South Lampung Regency. It examines the impact of helminthiasis knowledge, preventive behaviors, helminth infection rates, and various social determinants of health on maternal nutrition.

METHODS

This research employed an analytical survey method with a cross-sectional approach and was conducted within the working area of the Karang Anyar Community Health Center from November to December 2023. The study population was the pregnant women visiting the health center during this period. A total of 86 pregnant women who met the inclusion criteria—healthy without chronic diseases such as diabetes mellitus (DM), and willing to provide informed consent—were selected as participants. Pregnant women who did not provide stool specimens and did not complete the questionnaire were excluded.

Nutritional status was assessed using Upper Arm Circumference (MUAC tape), while helminthiasis was evaluated using the formal ether concentration method with ether as a solvent and 1% Lugol's iodine as a dye. Data on knowledge and preventive behaviors regarding helminthiasis were collected through a questionnaire.

Data analyzed using univariate and bivariate approaches. Univariate analysis described the frequency distribution of
variables such as knowledge, preventive behavior, helminthiasis status, and social determinants of health. Bivariate analysis utilized the chi-square test for knowledge and education variables, Fisher’s exact test for preventive behavior, helminthiasis incidence, age, and employment, and the Mann-Whitney test for income.

**RESULTS AND DISCUSSION**

The study included 86 respondents. Univariate analysis revealed various characteristics of the sample population, including knowledge levels about helminthiasis, preventive behaviors, helminthiasis status, and socio-demographic factors such as age, education, employment, and income among pregnant women in the Karang Anyar Health Center’s working area.

Based on the data in Table 1, 20 mothers had a MUAC below 23.5 cm, with the smallest measurement of 19 cm. The average MUAC among pregnant women at the Karang Anyar Community Health Center is 25.7 cm, indicating no signs of chronic energy deficiency. Helminthiasis assessment showed that 60% of pregnant women were infected with Ascaris lumbricoides, while 40% were infected with hookworm.

Knowledge scores about pregnancy reached a maximum of 88%, and preventive behavior scores were at 100%. The age of pregnant women ranged from 19 to 41 years, with the majority having completed high school education (45 women), and self-employment was the dominant occupation. The average per capita income among pregnant women in the study was Rp 1,046,955.

<table>
<thead>
<tr>
<th>Variable</th>
<th>(n)</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutritional status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CED (LiLA&lt;23.5 cm)</td>
<td>20</td>
<td>23.3</td>
</tr>
<tr>
<td>NoCED (LiLA≥23.5)</td>
<td>66</td>
<td>76.7</td>
</tr>
<tr>
<td><strong>Independent Variable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helminthiasis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative (STH eggs absent)</td>
<td>10</td>
<td>11.6</td>
</tr>
<tr>
<td>Positive (STH eggs present)</td>
<td>76</td>
<td>88.4</td>
</tr>
<tr>
<td>Knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor (&lt; 75%)</td>
<td>42</td>
<td>48.8</td>
</tr>
<tr>
<td>Good (≥75%)</td>
<td>44</td>
<td>51.2</td>
</tr>
<tr>
<td>Preventive Behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor (&lt; 75%)</td>
<td>21</td>
<td>24.4</td>
</tr>
<tr>
<td>Good (≥75%)</td>
<td>65</td>
<td>75.6</td>
</tr>
<tr>
<td>Mother’s Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High risk (&lt;20 dan &gt;35 tahun)</td>
<td>11</td>
<td>12.8</td>
</tr>
<tr>
<td>Low risk (20-35 tahun)</td>
<td>75</td>
<td>87.2</td>
</tr>
<tr>
<td>Education Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (Elementary and Junior High School)</td>
<td>35</td>
<td>40.7</td>
</tr>
<tr>
<td>High (High School/Vocational School/University)</td>
<td>51</td>
<td>59.3</td>
</tr>
<tr>
<td>Employment</td>
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<tr>
<td>Unemployed</td>
<td>76</td>
<td>88.4</td>
</tr>
<tr>
<td>Employed</td>
<td>10</td>
<td>11.6</td>
</tr>
<tr>
<td>Per Capita Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Standard (Rp 3,985,644)</td>
<td>86</td>
<td>100</td>
</tr>
<tr>
<td>Above Standard (Rp 3,985,644)</td>
<td>0</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Based on the bivariate analysis presented in Table 2, it was revealed that 21.4% of pregnant women with Chronic Energy Deficiency (CED) exhibited poor knowledge, whereas 25% of those without CED demonstrated good knowledge. Conversely, 78.6% of pregnant women without CED had poor knowledge, while 75% showed good knowledge. These findings suggest that there is no statistically significant relationship between the level of knowledge regarding helminthiasis and the nutritional status (specifically Chronic Energy Deficiency) of pregnant women.

Table 2. Bivariate Relationship between Dependent and Independent Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Nutritional Status</th>
<th>LiLA (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td></td>
<td>0.891a</td>
</tr>
<tr>
<td>Preventive Behavior</td>
<td></td>
<td>1.000b</td>
</tr>
<tr>
<td>Helminthiasis</td>
<td></td>
<td>0.009b*</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td>0.445b</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td>0.023a*</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td>0.232b</td>
</tr>
<tr>
<td>Per Capita Income</td>
<td></td>
<td>0.001a*</td>
</tr>
</tbody>
</table>

a: Chi-square test 2x2
b: Fisher's exact test
c: Mann-Whitney test
* Related significantly

Among pregnant women of Chronic Energy Deficiency (CED), 23.8% exhibited poor helminthiasis prevention behavior, and 23.1% demonstrated good prevention behavior. In contrast, among pregnant women without CED, 76.2% showed poor prevention behavior and 76.9% exhibited good prevention behavior. Statistical analysis indicated no significant relationship between helminthiasis prevention behavior and nutritional status.

Regarding helminthiasis incidence, 60% of CED pregnant women tested positive, and 18.4% tested negative. In pregnant women without CED, 40% tested positive and 81.6% tested negative. The analysis revealed a significant relationship between helminthiasis incidence and the nutritional status of pregnant women.

The CED pregnant women aged have a high risk are 9.1%, whereas who with a low risk are 25.3%. In pregnant women without CED, 90.9% were at high risk and 74.7% at low risk. Analysis did not find a significant relationship between maternal age and nutritional status.

The CED pregnant women with low education levels were 37.1%, whereas who with high education levels were 13.7%. In contrast, among pregnant women without CED, 62.9% had low education and 86.3% had high education. The results indicated a significant relationship between maternal education and nutritional status.

Among CED pregnant women, 21% did not employed, 40% were employed. In pregnant women without CED, 78.9% were unemployed and 60% were employed. Statistical analysis did not find a significant relationship between employment status and maternal nutritional status.

CED pregnant women had an average income of IDR 757,583.25, whereas
pregnant women without CED had an average income of IDR 1,134,644.02. These findings indicated a significant income disparity between the two groups, and correlates with differences in nutritional status.

Based on the data on pregnant women’s knowledge, it was found that more pregnant women had a good level of knowledge about helminthiasis compared to those with poor knowledge. These findings align with the research conducted by Sulastri and Triana [10], which reported that 63% of pregnant women had a good level of knowledge, whereas only 41% had poor knowledge [10]. Community health center programs, such as classes for pregnant women, play a crucial role. These programs provide training and enhancement of knowledge, shift attitudes, and modify behaviors. They cover topics like infectious diseases and promote clean and healthy lifestyles, which are essential for protecting pregnancies from infection [11].

Regarding preventive behavior against helminthiasis, there were mothers showed better preventive behavior. These results align with research [12], that the prevalence of poor preventive behavior was lower (25%) compared to good preventive behavior (75%). Helminthiasis prevention behavior includes some habits such as washing hands before eating and after defecating, washing fruits and vegetables before consumption, wearing sandals when leaving the house, and using a toilet.

Community health center programs, i.e. classes for pregnant women, can significantly increase awareness and knowledge about helminthiasis prevention and personal hygiene. Through these programs, pregnant women can adopt better health-maintaining behaviors. Additionally, adults generally have greater awareness of personal hygiene, resulting in better preventive behavior against helminthiasis compared to children [6].

The incidence of helminthiasis in pregnant women at the Karang Anyar Community Health Center was found to be low. The incidence of helminthiasis in pregnant women at the Karang Anyar Community Health Center is relatively low. The lower incidence may be attributed to the fact that helminthiasis is more common in children than in adults, primarily due to higher levels of exposure among preschool and school-aged children.

Globally, the prevalence of helminthiasis is significant, where 260 million preschool-aged children, 654 million school-aged children, and 138.8 million pregnant and breast-feeding women infected. Children are at greater risk of being infected with soil-transmitted helminths (STH) due to exposure through soil when playing and a lack of personal hygiene, such as washing hands before eating [6]. In addition, the incidence of helminthiasis is influenced by the immune system. Children's developing immune systems make them more susceptible to infection. Elderly individuals with weakened immunity also have a higher risk of helminthiasis [13].

This study indicates that most pregnant women at the Karang Anyar Community Health Center are at low risk aged between 20-35 years. This finding aligns with another study showing that 74.6% of mothers are at low risk, while 25.4% are at high risk [14]. The peak fertility age for women is between 20-29 years, during which they have a 95% chance of getting pregnant. This probability decreases to 90% at age 30 and significantly drops to 10% by age 40 [15].
Pregnant women at the KarangAnyar Community Health Center generally have a higher level of education. This finding aligns with research by Tahir, that 65.22% of mothers have a high level of education [16]. This corresponds with Indonesia’s educational landscape, where high school or equivalent education predominated, accounting for 30.22% in 2023 [17].

The study indicated that the majority of pregnant women at the Karang Anyar Community Health Center are housewives, and found a higher prevalence of non-working mothers. This finding is consistent with the study reported by Halimah et al., that only 26.9% of pregnant women are employed [14]. According to the data of 2022, the number of female workers in Indonesia was 52.74 million (39.98%), with the largest proportion are sales workers, comprising 28.44% [18].

The per capita income of pregnant women at the Karang Anyar Community Health Center is all below IDR 3,985,644, the per capita income of South Lampung [19]. The low rate of family income among pregnant women is high, consistent with the employment characteristics where the prevalence of non-working mothers was high. This finding aligns with previous research, that the proportion of low income among pregnant women is significantly higher (72.7%) than that of with high income [20]. Similarly, a study by Utami et al. found that 63.3% of mothers had low family income, only 36.7% had high family income [21].

The nutritional status of pregnant women at the Karang Anyar Community Health Center shows a higher prevalence of women with normal nutritional status, without chronic energy deficiency (CED), compared to those with malnutrition and CED. This positive outcome may be related to the Ministry of Health’s program, which focuses on improving the nutrition of pregnant women through a supplementary feeding program (PMT) made from local food. This program is a strategic approach to addressing nutritional issues, supplemented by nutritional education aimed at influencing dietary behaviors and enhancing maternal sanitation [22].

No correlation between knowledge related to helminthiasis and the nutritional status of pregnant women, as measured using MUAC, with a p-value of 0.891. This lack of correlation may be due to the small difference in the proportion of mothers with poor knowledge versus those with good knowledge, irrespective of their nutritional status. Consequently, the p-value is larger, indicating insignificant results.

According to UNICEF, knowledge plays a crucial role as a primary causal factor of poor nutritional status in pregnant women [5]. Low knowledge can affect the future behavior of pregnant women. Knowledge about infections influences nutritional status through preventive behaviors against infectious diseases. Therefore, indirectly, knowledge can affect the nutritional status of pregnant women by enabling them to protect and prevent themselves from infections. However, individual behavior is not only depended on knowledge but also on the attitudes on the benefits of the knowledge possessed. There are also other factors influence the relationship between knowledge about helminthiasis and the nutritional status of pregnant women.

This research aligns with the findings reported by Hadijah et al., that there was no relationship between the level of knowledge and the incidence of helminthiasis in the community, with a p-value of 0.737 [23]. Similarly, Muslimah et al. found no relationship between
knowledge and the incidence of helminthiasis among waste car fleet workers in Makassar, a population at higher risk for worms [24]. Thus, knowledge may have an insignificant relationship with nutritional status because it does not significantly relate to helminthiasis, affect nutritional status.

No relationship was observed between helminthiasis prevention behavior and the nutritional status of pregnant women, as measured using MUAC, with a p-value of 1.000. Similar to knowledge about helminthiasis, helminthiasis prevention behavior indirectly mumpuni affect the nutritional status of pregnant women through its impact on the incidence of helminthiasis.

According to Mumpuni et al. [25], certain behaviors may not directly correlate with the incidence of helminthiasis, as evidenced by a p-value of 0.068 [25]. This could be attributed to incorrect implementation of preventive measures, such as inadequate hand washing practices, which may still lead to helmint infections despite attempts to prevent them [26].

This study identified a relationship between the incidence of helminthiasis and the nutritional status of pregnant women, as measured using MUAC, with a p-value of 0.009. These findings are consistent with theories regarding factors influencing the nutritional status of pregnant women. Factors that directly affect nutritional status include adequate nutrient intake and the presence of chronic diseases or helminthiasis infections [5].

Helminths such as Ascaris can lead to nutritional competition, reducing the absorption of protein, fats, vitamin A, iodine, and other micronutrients. Additionally, adult worms can damage intestinal villi, impairing their ability to absorb nutrients effectively [27]. Meanwhile, hookworms can cause continuous micro-bleeding due to their cutting plates and sharp teeth, leading to iron deficiency anemia [28]. This aligns with research by Van Eijk et al., who found a relationship between hookworm infection and low upper arm circumference, with an average decrease of 0.7 cm below 23.5 cm [29].

No relationship was found between social determinants of health and age factors affecting the nutritional status of pregnant women, as measured using MUAC, with a p-value of 0.441. Age appears to be a primary causal factor influencing the nutritional status of pregnant women. However, other significant causal factors were not explored in this study, including maternal nutrition knowledge, social environmental conditions, and local cultural influences on maternal dietary patterns [30].

These findings are consistent with research by Antarsih and Suwarni [31], that there is no significant relationship between age and the incidence of Chronic Energy Deficiency (CED) among pregnant women in Bumi Agung District, Way Kanan Lampung, with a p-value of 0.837 [31].

This study found a significant relationship between the social determinant of health, specifically the level of education, and the nutritional status of pregnant women, as measured using the MUAC (p = 0.023). Analysis of the distribution of pregnant women revealed that those with Chronic Energy Deficiency (CED) and poor nutrition were predominantly mothers with lower education levels, whereas those with normal nutrition were predominantly mothers with higher education levels. This suggests that higher maternal education correlates with better maternal nutrition.
The level of education among pregnant women can influence their dietary choices, leading to a balanced and varied diet that helps prevent CED [30]. Education also plays a crucial role in providing information related to health-supporting practices and enhancing quality of life. Educated individuals are more likely to adopt healthy lifestyles and actively engage in development initiatives due to their enhanced access to information [32].

These findings align with research results of Sumiati, which revealed a relationship between education level and the incidence of CED among pregnant women at the Talang Banjar Community Health Center in Jambi City (p = 0.018) [33].

There is a relationship between the social determinant of health (employment status) and the nutritional status of pregnant women, as measured using the MUAC, with a p-value of 0.232. This result may be attributed to the fact that family income has a greater influence on the nutritional status of pregnant women. Higher income levels, independent to the number of family members working, tend to correlate with better ability to meet nutritional needs [34]. Employment status, a fundamental category challenging pregnant women, is affected by other factors that significantly affect nutritional status. These factors include the adequacy of food consumption, accessibility to nutritious food, dietary behaviors, and access to healthcare services and social protections.

This perspective is supported by Kuswardani et al., who found no significant relationship between age and the incidence of Chronic Energy Deficiency (CED) in pregnant women (p = 0.354) [35].

This study identified a significant relationship between the social determinant of health, specifically per capita income level, and the nutritional status of pregnant women, with a p-value of <0.001. Pregnant women diagnosed with Chronic Energy Deficiency (CED) and malnutrition tended to have lower average per capita incomes compared to those without CED and with normal nutrition. This suggests that lower income levels are associated with a higher risk of malnutrition among pregnant women.

This finding is consistent with theoretical perspectives of the substantial influence of economic status on the nutritional well-being of pregnant women. Household economic adequacy, measured through per capita income, plays a crucial role in determining access to quality and sufficient food with high nutritional value and variety [36]. Pregnant women from economically secure households generally have better opportunities to maintain good nutrition compared to those from lower-income households [8].

In line with these findings, previous research conducted at the Seginim Community Health Center in South Bengkulu Regency also established a significant relationship between family income and the incidence of CED among pregnant women (p = 0.000) [37].

**CONCLUSION**

There is a significant relationship between the incidence of helminthiasis, education level, per capita income, and the nutritional status of pregnant women. Specifically, an increase of helminthiasis incidence correlates with a decline in the nutritional status of pregnant women. Conversely, higher education levels and per capita incomes are associated with good nutritional status among pregnant women. However, other factors such as knowledge about
helminthiasis, behaviors of prevent helminthiasis, age of pregnant women, and employment status do not significantly impacted the nutritional status of pregnant women in the KarangAnyar Health Center area, Jati Agung District, South Lampung Regency.

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REFERENCES


Helminthiasis and Factors Affecting the Nutritional... / 10


[29] A. M. van Eijk *et al.*, *"Geohelminth Infections among Pregnant Women in Rural Western Kenya; a Cross-


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