RELATIONSHIP BETWEEN KNOWLEDGE AND NUTRITION STATUS OF PREGNANT ADOLESCENTS IN ADJUMANI TOWN COUNCIL. A CROSS-SECTIONAL STUDY.

Charles Serwambala[1, 2], Joseph Kungu[1, 2,] Dr. Jane Frank Nalubega[1, 2]*
[1]Mild May Institute of Health Sciences
[2]Faculty of Agricultural Sciences, Uganda Christian University

Abstract
Background
Adolescent pregnancy is the incidence of pregnancy in females aged 10-19. The study aims to assess the relationship between knowledge, Attitude, and nutrition status of pregnant adolescents in Adjumani Town Council.

Methodology
A cross-sectional study consisting of 288 pregnant adolescents was conducted. Data was collected on socio-demographic variables, nutritional knowledge, attitudes, practices, and nutrition status indicators such as BMI. Pearson correlation was used to establish relationships between variables.

Results
41.7% (120/288) had a primary level of education and the majority 33.3% (98/288) were farmers. The Pearson correlation between dietary attitude and nutritional status was 0.007, indicating a negligible relationship. The p-value is 0.906, indicating no significant association between dietary attitude and nutritional status. The regression coefficient for nutrition knowledge is (B=-0.039, SE=0.058, β=-0.038, t=-0.686 and p=0.493). This indicates that nutrition knowledge is not a significant predictor of nutritional status. The regression coefficient for dietary attitude is (B=0.009, SE=0.056, β=0.009, t=0.154, and p=0.878), indicating that dietary attitude is not a significant predictor of nutritional status.

Conclusions
The majority of the pregnant adolescents had low nutrition knowledge, and were underweight high educational status was associated with good nutritional understanding.

Recommendations
The findings highlight the need for targeted nutritional education and counseling support to educate adolescents on the importance of a balanced diet and how to make healthier food choices within their means.

Corresponding Author: Dr. Jane Frank Nalubega
Email: *janecll.nalubega@gmail.com*
Mild May Institute of Health Sciences
Faculty of Agricultural Sciences, Uganda Christian University

Background

Adolescence refers to the period between 10-19 years old, and it is the transition period from dependent childhood to independent adulthood (Organization, 2005). The incidence of pregnancy in females aged 10-19 years is referred to as adolescent pregnancy (Ganchimeg et al., 2014). During this period, one is still undergoing both physical, mental/social development to cope with different needs. Globally, one in six individuals is a teenager between the ages of 10 and 19 years (WHO, 2017). Pregnancy among adolescents is a global health concern, particularly prevalent in low- and middle-income countries. The World Health Organization (WHO) estimates that approximately 16 million girls aged 15 to 19 and two million girls under 15 give birth annually, with complications during pregnancy and childbirth being the leading cause of death among adolescent girls aged 15 to 19 globally. The intersection of limited access to education, poverty, cultural practices, and inadequate healthcare contributes to the vulnerability of pregnant adolescents worldwide. The amount of nutritional information acquired by an individual has a major impact on their nutritional status as revealed in a study on the association of nutrition knowledge and attitude with dietary practices and the nutrition status of females in Nairobi City (Kinyua, 2013), where increase on knowledge was associated with high MUAC. Pregnant mothers in a study done in South Sumatra (Rahmiwati, 2015), showed that an increase in knowledge led to improvement in nutritional status where an increase in knowledge was related to high MUAC. Low nutrition knowledge was found to lead to poor dietary practices

(AbuBaker, 2015). The study aims to assess the relationship between knowledge, attitude, and nutrition status of pregnant adolescents in Adjumani Town Council.

Methodology
Research design

This study adopted a cross-sectional study design to collect data on Dietary Knowledge, Attitudes, Practices, and Nutritional status of pregnant adolescents. The cross-sectional study design involved the collection of data on the variables of interest at a single point in time. This design allowed for the assessment of the current nutritional knowledge, attitudes, and nutrition status of the pregnant adolescents in Adjumani Town Council. The cross-sectional design was well suited for this study for the following reasons: The cross-sectional design provided a snapshot of the nutritional knowledge, attitudes, practices, and nutrition status of pregnant adolescents at a specific point in time. This aligned with the research objective of determining the current state of these factors. The Cross-sectional study was efficient in terms of time and resources, as data can be collected from the target population at a single point in time, rather than requiring multiple rounds of data collection over time. The cross-sectional design allowed examination of the relationships between the independent variables (nutritional knowledge and attitudes) and the dependent variable (nutritional status) among the pregnant adolescents. Given the constraints of time and resources, a cross-sectional study was a feasible approach to address the research objectives within the given context of Adjumani Town Council. By adopting a cross-sectional study design, the researcher was able to provide a comprehensive assessment of the nutritional knowledge, attitudes, and nutrition status of pregnant adolescents in Adjumani Town Council, which can inform the development of targeted interventions and policies to address any identified gaps or issues like on educational level, Poor cooking practices, lack of Awareness, Emotions, and thoughts then lastly Acute malnutrition.

Study population

The study targeted all pregnant adolescents (10-19 years), who satisfied the selection criteria. Adjumani Town Council is situated in Adjumani District, located in the Northern region of Uganda. The town council encompasses an area of approximately 33 square kilometers and is characterized by its diverse landscape, including plains and scattered vegetation. With an estimated population of over 100,000 inhabitants, Adjumani Town Council serves as a bustling hub within the district. It is strategically positioned approximately 40 kilometers southwest of the district headquarters, making it easily accessible via major transportation routes. Adjumani Town Council is made up of three parishes and Twenty-five villages. Thousands of refugees in Adjumani are mainly from South Sudan and are of diverse ethnic backgrounds; Dinkas, Kuku, Nuer, Kakwa, Madi, and Siluk are housed there. These villages are home to a diverse population, consisting of various ethnic groups and cultures. Additionally, Adjumani Town Council has emerged as a significant host community for refugees fleeing conflicts in neighboring countries such as South Sudan and the Democratic Republic of the Congo. Adolescent pregnancies are associated with higher risks of adverse maternal and neonatal outcomes compared to adult pregnancies. Pregnant adolescents are a vulnerable population that requires special attention and support. By selecting the study population of pregnant adolescents aged 10-19 years in Adjumani Town Council, the researcher effectively addressed the research objectives and generated valuable insights to improve the nutritional knowledge, attitudes, practices, and status of this vulnerable population.

Study sample computation

The sample for the study was drawn from the identified target population through a systematic sampling approach, ensuring representation across different demographic characteristics such as age, marital status, and socioeconomic status. This sampling strategy aimed to capture the diversity within the population and provide insights into the nutritional status and practices of pregnant adolescents in Adjumani Town Council The Fisher's equation (Jung, 2014);

$$n = \frac{z^2 X p X q}{d^2}$$

was used to determine the sample size where the total population is greater than 10,000.

n = desired sample size

z = the standard normal deviate at the required confidence level (1.96 for a

95% confidence level)

p the proportion of the target population estimated to have the characteristics being measured (0.25 for 25%) q= complementary proportion to $p(1 - 0.25 = 0.75)$ d = level of accuracy of the statistic being measured (0.05 for 5%)

The proportion of adolescent mothers either pregnant or lactating is 25%

(UBOS & ICF, 2018), hence 0.25 Plugging in the values:

$$= \frac{1.96^2 \times 0.25 \times 0.75}{0.05^2}$$

$$n = \frac{3.8416 \times 0.1875}{0.0025}$$

$$n = \frac{0.7206}{0.0025}$$

=288.24 participants

The sample size (n) selected required for the study was 288.

Inclusion Criteria

The study included all pregnant adolescents (10-19 years) who had been residents of Adjumani Town Council for six months before data collection and who consented to the study.

Exclusion Criteria

The study excluded pregnant adolescents who were above 19 years old. In addition, those who are mentally ill, very busy, and very sick were excluded.

Sampling techniques

Two-stage cluster sampling technique was used. Adjumani Town Council has 7 villages from which the primary clusters were identified using simple random sampling by listing the names of the 7 villages on pieces of paper, shaking them in a handy container, throwing them on the ground, and picking the first three without replacement to ensure equal chance of participation. Also, the primary clusters were households from the villages selected having pregnant adolescents. Since there was a list of households to be used as a guide, the researcher used a systematic random sampling technique in the selected villages. The researcher determined the sampling interval by dividing the total number of households with pregnant adolescents by the required sample size. Then randomly selected the first household to be included in the sample by generating a random number between 1 and the sampling interval. After selecting the first household, proceeded to select every g-th household (where g is the sampling interval) until the desired sample size was reached. For example, if there were 500 households with pregnant adolescents in the selected primary clusters, and the required sample size is 289, the sampling interval would be 500 / 289 = 1.73. Rounding down, the sampling interval would be 2. The researcher then randomly selected the first household by generating a random number between 1 and 2 and then selected every 1st household thereafter until the sample of 289 pregnant adolescents was achieved.

Data collection methods
Qualitative Methods

Qualitative data were obtained through semi-structured interviews and key informant interviews. Semi-structured interviews were conducted with caregivers of pregnant adolescents to gain insights into household dynamics and support systems. Key informant interviews were conducted with healthcare providers and community leaders to understand contextual factors influencing maternal nutrition.

Structured interviews

Structured interviews using 24-hour dietary recalls were conducted to enhance the precision of estimating the usual dietary intakes of the selected respondents. This method provided detailed information on the types of food consumed throughout the day, offering a comprehensive view of their dietary practices.

Face-to-Face Structured Interviews

Face-to-face structured interviews with primary caregivers and participants were conducted to allow for an in-depth exploration of socio-demographic characteristics, feeding practices, and nutritional status. The interviews were conducted in the local language to ensure clear communication and accurate data collection.

Quantitative Methods

For the quantitative part of the study, a structured survey questionnaire was administered to both caregivers and pregnant adolescents. The questionnaire gathered information on the general characteristics, nutritional status, and dietary Practices of pregnant adolescents. Specific areas of inquiry included dietary diversity, frequency of food consumption towards healthy eating, and practices related to meal preparation and consumption. The combination of quantitative and qualitative approaches enabled the researcher to collect comprehensive and reliable data to address the research objectives effectively.

Data collection tools
Surveys and Questionnaires

A research-administered questionnaire was used for data collection on socioeconomic characteristics, dietary knowledge, attitudes and practices, and nutritional status. The level of nutritional knowledge and attitude were determined by the use of a modified questionnaire template from Marías and Glasauer (2014). The respondents were allowed to choose correct answers by indicating whether a given statement was "Yes" or "No". The responses were then scored and computed for the nutrition knowledge and attitude variables.

Interviews

Interviews provide in-depth information on dietary knowledge and attitude and nutrition status among pregnant adolescents and are useful for qualitative research. They were conducted in person (face to face) and the interviews were both structured and unstructured. A 24-hour recall was used to collect information on dietary practices related information. The questionnaire also had a section for collecting data on nutrition status by use of MUAC- a recognized method to depict the nutritional status of pregnant mothers (Farreda et al., 2015).

Data analysis
Quantitative data analysis

The raw data from the questionnaires were coded, cleaned, sorted, and then exported into the SPSS (Version 20) data analysis package which was analyzed quantitatively using descriptive statistics like frequency counts and then presented in comprehensive tables and charts showing the responses.

Validity and reliability
Content Validity

Content validity was ensured by involving a panel of experts in the development of the questionnaire. This

panel provided feedback on the relevance, clarity, and simplicity of the items, and the questionnaire was modified accordingly.

Construct Validity

Construct validity was assessed through statistical methods to determine whether the items in the questionnaire measured the constructs they were intended to measure accurately. The questionnaire used in the study was approved by a supervisor to ensure that it is appropriate for the research question and that it measures the constructs it is intended to measure accurately.

Research assistants (VHTs) were thoroughly trained to ensure that they understood the questionnaire and the procedures for administering it. This helped to minimize errors and ensured that the data collected was reliable.

Statistical Analysis was done. Statistical methods were used to assess the correlation between different variables and to ensure that the findings were statistically valid.

Reliability

It is a crucial aspect of quantitative research, as it ensures that the data collected is accurate and can be replicated. The reliability of the questionnaire was based on the pilot results. The questionnaire was piloted on pregnant adolescents aged 15 – 19 years in Adjumani town council, Adjumani district. The piloted results were entered into SPSS Version 20 and a reliability analysis was conducted and revised to ensure that the data collected in this study is consistent, stable, and can be replicated, thereby enhancing the overall quality and trustworthiness of the research findings.

Quality control

The researcher (nutrition student) collected accurate data and ensured ethical considerations were followed. The respondents were taken through the process of understanding the research purpose the risks of being involved in the study, and the definition of the terms that were used. Research assistants (VHTs) were trained especially on how to collect more accurate data and how to ensure ethical considerations are followed. Data tools were reviewed for completeness and accuracy. Data collection tools were pre-tested to ensure accuracy.

Ethical considerations

The study was for academic purposes and the information obtained from the respondents was treated with confidentiality and anonymity. After approval of this research proposal, permission to collect data and information was facilitated through a letter of introduction from the Faculty of Agricultural Sciences, in the Uganda Christian University. In addition to this, permission from local Government Authorities was obtained. Informed consent was sought from each participant before the commencement of an interview. Also, participants were free to answer some of the questions or end the interview at any time when they felt to do so. Moreover, all information gathered was handled with utmost confidentiality.

Results

Data presentation and analysis

A total of 288 pregnant adolescents participated in this study. The mean age of the participants was 17.88 years while the age range was from 15 to 19 years.

Univariate Analysis

Table 1: Demographic and Socio-Economic characteristics of the participants.

Variable	Frequency (n=288)	Percentages (%)
Age		
15 years	24	8.3
16 years	24	8.3
17 years	36	12.5
18 years	84	29.2
19 years	120	41.7
Religion		
Anglican	36	12.5
Muslim	72	37.5
Catholic	96	33.3
Born Again	48	16.7
Marital status		
Single	72	25.0
Divorced	36	12.5
Married	180	62.5

Education Level		
Undergraduate	12	4.2
Certificate	72	25.0
Secondary	84	29.2
Primary	120	41.7
Occupation shop attendant	72	25.0
Farmer	98	33.3
Market Vendor	48	16.7
Cleaner	12	4.2
Home keepers/No job	60	20.8
Monthly Income Level		
<50,000shs	120	41.7
50,000-<100,000shs	72	25.0
100,000-<200,000shs	12	4.2
200,000-<400,000shs	72	25.0
400,000-<600,000shs	12	4.2

In Table 1, about half of the participants 41.7% (120/288) were age 19 years and 62.5% (180/288) of the participants were married. 41.7% (120/288) had a primary level of education and the majority 33.3% (98/288) were farmers with 41.7% (120/288) having a monthly income level of <50,000shs.
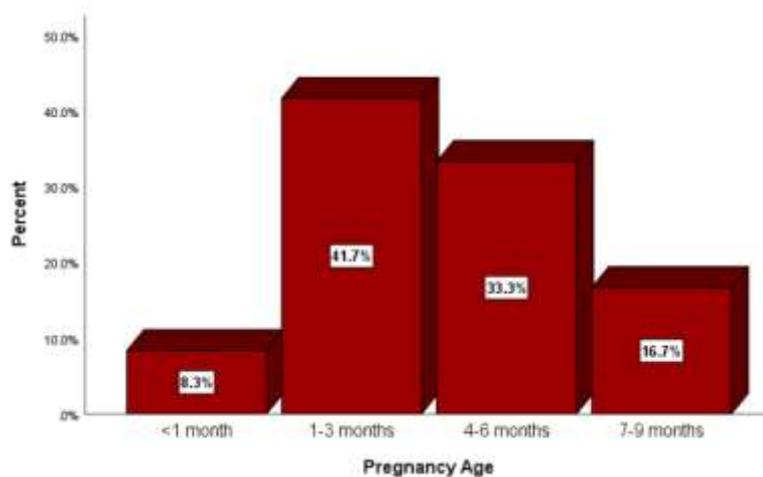
Figure 2: Percentages of pregnant adolescents and their pregnancy age.

Figure 1, shows the pregnancy age of the adolescents. About half 41.7% (120/288) participants had a pregnancy of 1-3 months.

Number of ANC Visits among pregnant adolescents.
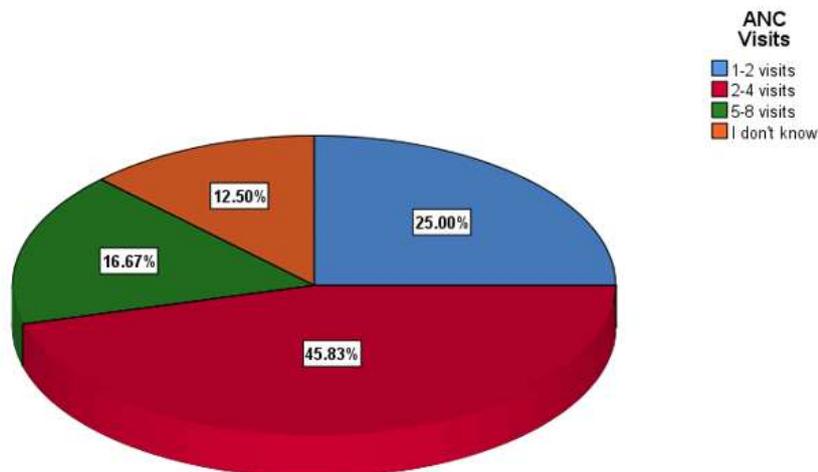
Figure 3: Number of ANC Visits among pregnant adolescents in Adjumani District.

Figure 3 shows the number of ANC Visits among pregnant adolescents. 25% (72/288) of the pregnant adolescents attended at least 12 visits, 45.83% (132/288) attended 2-4 visits, 16.67% (48/288) attended 58 visits and 12.5% (36/288) didn't know the number of visits that they attended
.

Nutrition status of pregnant adolescents.
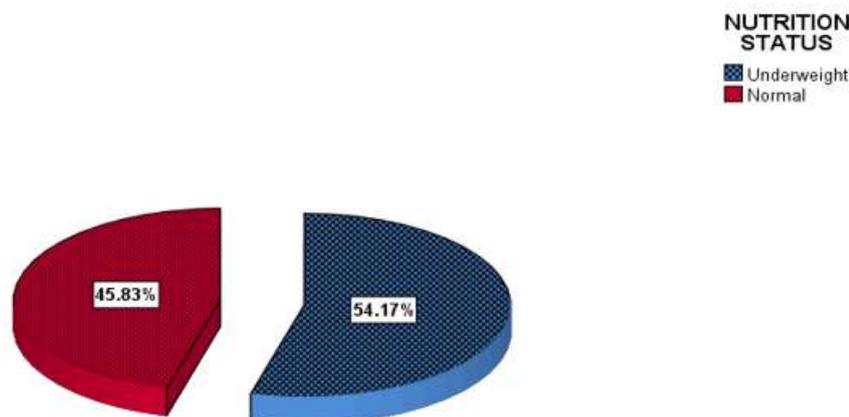
Figure 4: Nutrition status of pregnant adolescents.

Figure 4 shows the nutrition status of pregnant adolescents. 54.17% (156/288) of the pregnant adolescents were underweight and the rest 45.83% (132/288) had a normal nutrition status.

Descriptive statistics of nutrition knowledge, attitude of pregnant adolescents

Table 2: Mean and standard deviation of nutrition knowledge, attitude, and practices of pregnant adolescents

Variables (N=288)	Mean	Std. deviation
Nutrition Knowledge	1.63	0.485
Dietary attitude	1.54	0.499
Nutrition status	0.54	0.499

Table 2, the mean value of nutrition knowledge indicates a moderate level of nutrition knowledge among the participants, with some variability. The mean dietary attitude score indicates a slightly positive attitude towards dietary practices, with a standard deviation close to 0.5, suggesting a moderate spread in the attitudes among the participants. The mean nutrition status score indicates that about half of the participants have a normal nutritional status, with a standard deviation indicating a moderate variation in nutritional status across the sample.

Table 3: Descriptive statistics of nutrition knowledge, attitude, and practices of pregnant adolescents

Variable	Frequency (n=288)	Percentages (%)
Nutrition knowledge		
Knowledgeable	108	37.5
Not knowledgeable	180	62.5
Dietary attitude		
Positive	132	45.8
Negative	156	54.2
Nutrition status		
Normal	132	45.8
Underweight	156	54.2

Table 3, only 37.5% (108/288) of pregnant adolescents were knowledgeable about nutrition, and 45.8% (132/228) of the pregnant adolescents had positive dietary attitudes.

Nutrition knowledge of pregnant adolescents

Figure 5 shows that 62.5% of pregnant adolescents are not knowledgeable about nutrition during pregnancy and only 37.5 % have some knowledge about nutrition during pregnancy.
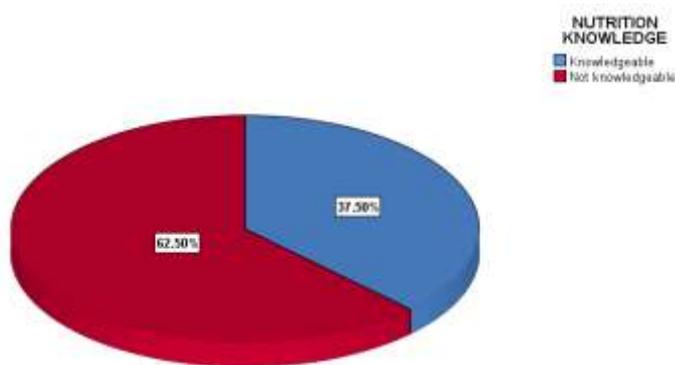
Figure 5: Nutrition knowledge of pregnant adolescents

Bivariate analysis

Table 4: Relationship between nutrition knowledge, attitude, and nutrition status of pregnant adolescent

Variable (N=288)	Normal	underweight	Pearson correlation	p-value	X^2
Knowledge Score			0.715	**0.000****	**0.000**
Knowledgeable	80 (60%)	53 (40%)			
Not (40%) Knowledgeable	52	78 (60%)			
Dietary attitude			-0.007	0.906	0.906
Positive	60(45.5%)	72(54.5%)			
Negative	72(46.2%)	84(53.8%)			

*Statistically significant factor

Nutritional Status

Among the 288 pregnant adolescents, 132 (45.8%) had a normal weight and 156 (54.2%) were underweight.

Relationship between Nutrition Knowledge and Nutritional Status

The Pearson correlation coefficient of 0.715 indicates a strong positive relationship between being knowledgeable and having a normal nutritional status. This is statistically significant at (p=0.00, x2=0.00). Therefore, knowledgeable individuals are more likely to be in the normal nutritional status category compared to those who are not knowledgeable. This finding is supported by the response from KII;

"The general level of nutritional knowledge among pregnant adolescents is quite low. Many of them do not understand the importance of certain nutrients during pregnancy", (midwife 1 from Adjumani Hospital)

Knowledgeable Adolescents:80 (60%) were of normal weight, while 53 (40%) were underweight.

Not Knowledgeable Adolescents: 52 (40%) were of normal weight, while 78 (60%) were underweight.

Relationship between Dietary Attitude and Nutritional Status

The Pearson correlation between dietary attitude and nutritional status was 0.007, indicating a negligible relationship. The p-value is 0.906, indicating no significant association between dietary attitude and nutritional status.

Positive Attitude:60 (45.5%) were of normal weight, while 72 (54.5%) were underweight.

Negative Attitude:72 (46.2%) were of normal weight, while 84 (53.8%) were underweight.

Multiple Regression Analysis

A multi-linear regression analysis was conducted to examine the relationship between nutrition knowledge, and dietary attitude, on the nutritional status of pregnant adolescents.

Table 5: Multi-linear regression analysis between nutrition knowledge, attitude, and practice of pregnant adolescents.

Variable	B	Coefficient Std. Error	β	t	p-value
Nutrition knowledge	-0.039	0.058	-0.038	-0.686	0.493
Dietary attitude	0.009	0.056	0.009	0.154	0.878

a. Dependent Variable: NUTRITION STATUS
*Statistically significant factor

Nutrition Knowledge

The regression coefficient for nutrition knowledge is (B=-0.039, SE=0.058, β=-0.038, t=-0.686 and p=0.493). This indicates that nutrition knowledge is not a significant predictor of nutritional status.

Dietary Attitude

The regression coefficient for dietary attitude is (B=0.009, SE=0.056, β=0.009, t=0.154, and p=0.878), indicating

that dietary attitude is not a significant predictor of nutritional status.

Discussion
Socio-demographic characteristics of pregnant adolescents.

The study found that pregnant adolescents who attained secondary and certificate levels of education were knowledgeable about nutrition compared to those who attained primary levels of education. This finding is in conjunction with another study finding where participants who attended college and above were 4.5 times more likely to be knowledgeable, and likewise, those who attended secondary school were 2.5 times more likely to be knowledgeable compared to participants who did not attend school at all (Gezimu,2022). Another study conducted in Addis Ababa, Ethiopia reported that pregnant adolescents who are educated had higher nutrition knowledge than those who are not educated (Zelalem, 2018). This is because educated pregnant adolescents can comprehend nutrition information more than those who are not educated or have a very low level of education.

Nutrition knowledge level of pregnant adolescents.

The study found that only 37.5% of pregnant adolescents knew about nutrition during pregnancy. A study by Chege, 2019 revealed that pregnant adolescents have low nutrition knowledge, and another study in Addis Ababa, Ethiopia found that only 27% of pregnant mothers knew about nutrition during pregnancy (Tesfaye, 2024). In a cross-sectional study carried out in southern Ethiopia, it was reported that 73% of participants had no nutrition knowledge (Zelalem, 2018) and in central Ethiopia, 76.3% had poor nutritional knowledge (Tesfaye, 2024). This could be due to the low number of pregnant adolescents who attend and receive nutrition education and counseling during ANC and also due to limited tailored nutrition support for pregnant adolescents. Nutrition knowledge is significantly associated with nutrition status. Pregnant adolescents who had high nutrition knowledge had good nutrition status.

Nutrition status of pregnant adolescents.

The study indicates that 54.17% (156/288) of the pregnant adolescents are underweight and 45.83% (132/288) have normal nutrition status. Undernutrition is detrimental to health both their health and the fetus. Studies have shown a high prevalence of underweight among pregnant adolescents, emphasizing the need for targeted interventions to improve their nutritional status.

Study Limitations

The study was limited to pregnant adolescents in Adjumani Town Council, thus the findings can only be replicated in similar settings. The tools and indicators used are majorly used for general mothers who are not adolescents and thus their use for this study might be a limitation. Additionally, the cause-effect relationship may not be established because the study was a cross-sectional design carried out among pregnant adolescents. In addition, the data was collected through the questionnaire, which relied on recall, hence recall bias. However, in a bid to mitigate this, the questions were broken down into sections during administration for easier understanding.

Conclusions
The majority of the pregnant adolescents had low nutrition knowledge, and were underweight high educational status was associated with good nutritional understanding.

Recommendations
The findings highlight the need for targeted nutritional education and counseling support to educate adolescents on the importance of a balanced diet and how to make healthier food choices within their means.

List of abbreviations
ANC: Antenatal Care
BMI: Body Mass Index
ICF: International Classification of Functioning, Disability and Health
MIHS: Mildmay Institute of Health Sciences
MUAC: Mid-upper arm circumference
UBOS: Uganda Bureau of Statistics
WHO: World Health Organization

Conflict of interest
The author did not declare any conflict of interest.

Author Biography
Charles Serwambala is a student of Bachelor of Science in Human Nutrition and Clinical Dietetics at Uganda Christian University at Mild May Institute of Health Sciences.
Joseph Kungu is a lecturer at the Mild May Institute of Health Sciences.

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