

# Nutrition Uptake among Pregnant Women: A Case of Solwezi District, North Western Province

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## Abstract

**Background:** Zambia has a population of 17.4 million people of which 48% are unable to meet their minimum calorie requirement and 35% of the children in Zambia are stunted (ZDHS, 2018). In the 2018 ZDHS report, 31% of women aged 15 - 49 had anaemia. Most cases of anaemia in pregnancy are due to micronutrient deficiency and maternal malnutrition. The 2020 Zambia Global Nutrition Report shows an increase in the prevalence of anaemia among women of reproductive age (45%) and low birth weight infants (13.0%) which suggested a need to explore determinants of pregnant women's nutrition uptake in order to improve the nutritional status of pregnant women particularly those in Solwezi district of the north-western province of Zambia. **Methods:** An analytical cross-sectional study was conducted on antenatal mothers aged 15 - 49 accessing routine antenatal care from four selected health facilities in Solwezi district from July 2021 to February 2021. Cluster sampling method was used to select the 4 health facilities and the 98 antenatal mothers were selected using systematic sampling method. Data was collected using a pretested researcher-assisted semi-structured questionnaire and analyzed using the SPSS version 26. Chi-square test was used to determine associations between the independent and independent variables. The level of significance was set at 0.05 and the confidence interval was set at 95%. Multiple logistic regression analysis was done to predict associations among variables. **Results:** The findings revealed that a large proportion of respondents (71.4 %) had high knowledge regarding nutrition during pregnancy compared to (19.4%) and (9.2%) who expressed medium and low knowledge levels respectively. Attitude towards nutrition in pregnancy was positive in the majority, 82 (83.7%) of the respondents, and over half, (55%) of the respondents reported good nutrition uptake during pregnancy. **Conclusions:** In

this study, nutrition uptake in pregnancy was significantly associated with women's attitudes towards nutrition. It was also observed that more respondents who had a positive attitude towards nutrition had good nutrition uptake during pregnancy. We can therefore, conclude that the research study has revealed that majority of the respondents had high knowledge level and positive attitudes towards nutrition during pregnancy and only half of the respondents had good nutrition uptake during pregnancy which should be able to prompt all the stakeholders of health to focus their attention on behavioural change messages, policies and intervention in order to enhance good nutrition uptake among pregnant women.

### **Keywords**

Pregnant Women, Determinants, Nutritional Uptake, Knowledge, Attitude, Practices

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## **1. Background Information**

Poor maternal nutrition and inadequate antenatal care contribute to maternal mortality during pregnancy and childbirth and also compromise the health and survival of infants and children [1]. Poor nutrition has the most damaging effect on the foetus during pregnancy and in the first two years of life, and the effects of this early damage on health, brain development, intelligence, education, and productivity are irreversible [2]. Women in developing countries are at risk of malnutrition and nutritional deficits during pregnancy resulting in negative pregnancy outcomes such as delay in foetal growth and development, pre-term delivery, low birth weight, and maternal Anaemia [3].

Zambia has a population of 17.4 million people of which 48% are unable to meet their minimum calorie requirement and 35% of the children in Zambia are stunted [4] A further 9 percent of children have a low birth weight of less than 2.5 kg. This simply shows that there is a lower-than normal development of the foetus before birth, which is a clear indication of the result of maternal malnutrition. In most cases, children born with low birth weight are under reported as a large number of new-born are not weighed at birth especially those born from home. Maternal malnutrition contributes to about 3.1 million or 45% of under five children deaths due to stunting, wasting, and micronutrient deficiencies of which 800,000 neonatal deaths were due to small for gestation age (SGA) births because it determines birth outcomes which is an important determinant of under nutrition in early life [4] According to [5], low-body mass index ( $<18.5 \text{ kg/m}^2$ ) among women of reproductive age (WRA) indicates maternal under nutrition is prevalent in Asia and Africa and has effects both on the course and outcome of pregnancy [4]. Although there has been a slight increase in the underweight rate among women of reproductive age (WRA) over the years, maternal nutrition during pregnancy has never been assessed [3] including the

prevalence of Anaemia among pregnant women.

Furthermore, the 2020 Zambia Global Nutrition Report shows an increase in the prevalence of Anaemia among women of reproductive age (45%). According to the same report, the prevalence of infants born with low birth weight is also increasing (13.0%) which is a clear indication that there is a need to explore more on determinants of pregnant women's nutrition uptake in order to come up with ways of improving the nutritional status of pregnant women in Zambia, particularly those in Solwezi district of the north-western province of Zambia.

Maternal nutrition has major influences on the general health and well-being of both the mother and the child. The availability and supply of nutrients to the developing fetus depend on the nutritional status of the mother. To help pregnant women achieve appropriate nutrition uptake, an insight into their knowledge, attitude, and practice toward nutrition is important. Knowledge and attitude towards nutrition during pregnancy are important determinants of good nutrition practices and are thus potential targets for appropriate planning of nutrition interventions such as behavioral change communication to women in the reproductive age (WRA), particularly pregnant and lactating women.

Maternal good nutrition during pregnancy helps in reducing maternal mortality and infant mortality. Findings on the determinants of nutrition uptake among pregnant women such as knowledge, attitude, and practice towards nutrition during pregnancy are hardly available. Micronutrient deficiencies like Anaemia among pregnant women in Zambia and high rates of babies born with low birth weight are clear indications of maternal malnutrition.

However, specific data for nutrition trends in expectant mothers in Solwezi district is scanty as reporting tools such as the District Health Information System (HMIS) do not cover the nutritional aspects of pregnant women. This provides a need to conduct a study that assesses the knowledge; attitude and practices toward nutrition among pregnant women. The study provides a basis for maternal nutrition-based education programs and interventions which will help to improve the quality of life for mother and their children which will in turn help reduce maternal and infant morbidity. Therefore, in this study, we aimed at assessing the level of knowledge, attitude, and practices toward maternal nutrition uptake during pregnancy in the Solwezi District.

## **2. Methodology**

### **2.1. Study Design**

In this study, a descriptive cross-sectional study design with the quantitative approach was used to answer the research questions. This study design was found appropriate for this study because the researcher wanted to observe and describe the determinants of nutrition uptake among pregnant women in Solwezi district at one point in time. In addition, the study design was chosen because it is less expensive, did not require a lot of time to execute and the results were obtained immediately [5]. Moreover, this research design is a roadmap for answering the

research question and testing the hypothesis [4].

## **2.2. The Study Area**

The study was conducted, among pregnant women attending antenatal care from four health facilities which were selected from Solwezi of North-Western Province. Solwezi district has thirty-two (32) health facilities of which only four were selected as study sites for this study. The selected health facilities were Solwezi urban clinic, Mushitala clinic, Kazomba clinic and Zambia clinic.

## **2.3. Study Population**

In this study, the study population was pregnant women attending antenatal clinic from Solwezi urban clinic, Mushitala clinic, Kazomba clinic and Zambia clinic in Solwezi district of the North-Western province of Zambia. The study population included pregnant women in the age group 15 years who attended Antenatal Care Services from the selected four health facilities. The age range 15 - 49 is important in studying pregnancy related conditions as it represents the reproductive age range among women, a period during which women are most likely to be pregnant.

## **2.4. The Eligibility Criteria**

### **2.4.1. Inclusion Criteria**

The study included pregnant women who were aged between 15 and 49 years of age as this is a period which is considered the reproductive age according to WHO. The participants should be residents of Solwezi district Pregnant women who attended Antenatal Care Services from the selected health facilities and which will make it easy to follow in case need arises.

### **2.4.2. Exclusion Criteria**

The pregnant women who had or developed obstetric complications were to be excluded from the study in order for them to receive prompt emergency obstetric care so as to prevent complications. The pregnant women who had pre-existing long-term nutritional conditions (Chronic debilitating medical conditions) will also be excluded from this study as they would not be in stable state to give appropriate responses to the research questions and they may feel as though they are being stigmatized against their nutritional status.

## **2.5. Sampling Method and Sample Size**

The health facilities (Solwezi urban clinic, Mushitala clinic, Kazomba clinic and Zambia clinic) were selected using simple random sampling method from a sampling frame of thirty-two (23) health facilities in Solwezi district [3]. The study used simple random sampling because the population is small, homogeneous and readily available. Each element of the frame has an equal probability of selection which provides for the greatest number of possible samples. This was done by assigning a number to each element in the sampling frame and a

table of random number or lottery system was used to determine which units are to be selected.

A systematic sampling method was used to select the study sample. This was done by arranging the target population by selecting elements at regular intervals through that ordered register. This involved a random start and then proceeding with the selection of every  $k$ th element from then onwards. In this case,  $k = (\text{population size}/\text{sample size})$ . A sample of 98 pregnant women out of 286 pregnant women attending antenatal in Solwezi district was obtained from selected health care facilities. In this study the study sample was selected at an interval of every third person “ $n^{\text{th}}$  ( $3^{\text{rd}}$ ) pregnant women” from the ordered register. The determination of the sample size was adopted from Daniel and Cochran formula.

## **2.6. Reliability and Validity**

### **2.6.1. Reliability**

In this study, reliability was ensured by standardizing the instrument for data collection. Simple language was used in the research instrument to enhance understanding. The research tool was tested before the main study was conducted using the pilot study in an environment with similar characteristics as the environment in which the main study was to be conducted. Inaccuracies in the instrument were being corrected where necessary and it helped to eliminate biases and minimize errors during data collection.

### **2.6.2. Validity**

Validity was assessed by conducting a pilot study to see if the instrument actually measured what it was intended to measure. The researcher ensured validity by conducting extensive literature search of current literature on the study and ensuring that all necessary information is included in the research instrument. To further enhance validity, the instrument was examined by the researcher supervisor and other experts in health and nutrition also examined the tool to determine whether it would elicit the desired information. Any questions that were not clear from the pilot study were corrected. In this study, the validity of the measuring instrument was observed by adhering to the characteristics of all three measures.

## **2.7. Data Collection Technique**

Data was collected using face-to-face interviews in order to get more precise information from the participants. Self-introduction of the researcher to the participant was done to gain the confidence of the participants which was followed by a clear explanation of the purpose of the study. The participant was assured of confidentiality and anonymity in order to gain their cooperation. An informed consent was obtained from the study participants, and assent was obtained from the participants who were below 18 years. The researcher read out the questions to the participants and recorded their responses appropriately.

At the end of the interview, the researcher went through the interview schedule to check the consistency in the answers given and the completeness of the interview schedule and inquired from the interviewee if they had any questions, comments or contributions regarding the study and then thanks the participants for taking part in the study. Each interview lasted for appropriate 20 to 30 minutes.

### **2.8. Data Management and Storage**

The researchers checked through the collected data on daily basis to ensure completeness and accuracy of the data. The completed interview schedules were kept under strict security conditions to avoid unauthorized access to the information contained in them. These measures include; keeping in a lockable cupboard, and putting password on the computer to prevent access from the unauthorized persons. After data collection, the data was coded and then entered into a statistical analysis software package, SPSS version 26. Univariate analysis was performed to obtain frequency and percentage for demographic variables, knowledge regarding nutrition in pregnancy attitude towards nutrition and socio-cultural practices regarding nutrition during pregnancy among pregnant women. Chi-square test was performed to draw out possible associations between pregnant women's nutrition uptake and other variables. Bivariate and multivariate logistic regression analysis was carried out to determine factors influencing pregnant women's nutrition uptake. The significant level was set at a p-value of  $< 0.05$ .

### **2.9. Pilot Study**

A pilot study was conducted at Kimasala urban clinic maternal and child health clinic, a week before the commencement of the full study. In this study, 10% of respondents of the proposed sample were used as the sample size for the pilot study as suggested by [6] This was a feasibility study that would enable the researcher to refine the process of research activities to be carried out and to get an idea of the content of the data before conducting the research. Participants were selected using systematic sampling method. Analysis of the results of the pilot study confirmed that the stated objectives and questions were adequately attained and answered accordingly. The participants who took part in the pilot study were not included in the main study.

### **2.10. Ethical Considerations**

The approval to conduct the study was obtained from the University of Zambia Biomedical Research Ethics Committee (UNZABREC) (REF: 1669-2021) and permission to carry out the study was obtained National Health Research Authority (NHRA). Permission to conduct the study was obtained from Solwezi District Health Office. Permission from the health facility was sought to carry out the study from the facility in charge. Personal informed consent from the pregnant women who are 18 years and above, and assent for the under the age of

18 years were also obtained. Participants were given an explanation of the purpose of the study and that they had the right to participate or withdraw from the study. The participants were assured of confidentiality and anonymity of personal information that was shared with the researcher.

### 3. Study Findings

#### 3.1. Socio-Demographic Characteristics

A total of 98 pregnant women participated in the study. The socio-demographic characteristics of the study participants are shown in **Table 1**. Majority of the respondents, (86.7%) were married and most (63.3%) attained secondary level of education only (7.1%) were in formal employment, while over half, (59.2%) were housewives. Most of the respondents, (61.2%) had a middle-class wealth index and the majority, (87.8%) resided in urban areas. Many respondents were

**Table 1.** Demographic characteristics of respondents (n = 98).

Variable	Category	Frequency (n)	Percent (%)
<b>Age in years</b>	15 - 24 years	38	38.8
	25 - 34 years	52	53.1
	35 - 44 years	8	8.2
<b>Marital status</b>	Unmarried	13	13.3
	Married	85	86.7
<b>Education level</b>	Primary	22	22.4
	Secondary	62	63.3
	Tertiary	14	14.3
<b>Occupation</b>	Formal	7	7.1
	Informal	33	33.7
	Housewife	58	59.2
<b>Wealth Index</b>	High	29	29.6
	Middle	60	61.2
	Low	9	9.2
<b>Place of residence</b>	Urban	86	87.8
	Rural	12	12.2
<b>Gestation age</b>	First trimester	16	16.3
	Second trimester	44	44.9
	Third trimester	38	38.8
<b>Parity</b>	No children	20	20.4
	≤4 children	71	72.4
	>4 children	7	7.1

either in their second (44.9%) or third (38.8%) trimester of pregnancy and majority, (72.4%) had not more than 4 children.

### 3.2. Knowledge Levels

As shown in **Table 3**, the majority of respondents agreed that a balanced diet is necessary during pregnancy (91.8%), good nutrition during pregnancy is necessary for foetal development (92.9%) and that sources of vitamins and minerals are fruits and vegetables, milk (87.8%). Similarly, most respondents indicated that women's nutrition requirements increase during pregnancy (77.6%) and that being underweight during pregnancy can affect baby's well-being and growth (72.4%). On the other hand, around a quarter, (25.5%) reported that obesity during pregnancy did not increase the risk of pregnancy problems, nutrition deficiency during pregnancy could not affect health status of mother and baby (21.4%) and (29.6%) and (34.7%) were unsure about the sources of proteins and carbohydrates respectively. A large proportion of respondents, (71.4%) expressed high knowledge regarding nutrition during pregnancy compared to (19.4%) and (9.2%) who expressed medium and low knowledge levels respectively.

### 3.3. Attitude towards Nutrition

As shown in **Table 3**, the majority of respondents agreed that a balanced diet is necessary during pregnancy (91.8%), good nutrition during pregnancy is necessary for foetal development (92.9%) and that sources of vitamins and minerals are fruits and vegetables, milk (87.8%). Similarly, most respondents indicated that women's nutrition requirements increase during pregnancy (77.6%) and that being underweight during pregnancy can affect baby's well-being and growth (72.4%). On the other hand, around a quarter, (25.5%) reported that obesity during pregnancy did not increase the risk of pregnancy problems, nutrition

**Table 2.** Respondents knowledge (n = 98).

Knowledge variable	Yes n (%)	No n (%)	Not sure n (%)
A balanced diet is necessary during pregnancy	90 (91.8)	7 (7.1)	1 (1.0)
It is important for a pregnant woman to take a balanced diet three times a day	83 (84.7)	14 (14.3)	1 (1.0)
Women's nutrition requirements increase during pregnancy	76 (77.6)	16 (16.3)	6 (6.1)
Nutrition deficiency during pregnancy could affect health status of mother and baby	71 (72.4)	21 (21.4)	6 (6.1)
Good nutrition during pregnancy is necessary for foetal development	91 (92.9)	1 (1.0)	6 (6.1)
Sources of protein are lean meat, fish, milk and beans.	63 (64.3)	6 (6.1)	29 (29.6)
Sources of carbohydrates are grains and cereals	52 (53.1)	12 (12.2)	34 (34.7)
Sources of vitamins and minerals are fruits and vegetables, milk	86 (87.8)	3 (3.1)	9 (9.2)
Being underweight during pregnancy can affect baby's well-being and growth	71 (72.4)	19 (19.4)	9 (9.2)
Being obese during pregnancy increases the risk of several pregnancy problems	64 (65.3)	25 (25.5)	9 (9.2)



**Table 3.** Attitude towards nutrition (n = 98).

Attitude variable	Category	Frequency (n)	Percent (%)
<b>I take a balanced meal 3 times a day</b>	Agree	61	62.2
	Disagree	36	36.7
	Neutral	1	1.0
<b>Preparing a balanced meal is time-consuming</b>	Agree	27	27.6
	Disagree	57	58.2
	Neutral	14	14.3
<b>It is not important for pregnant women to know about preparing a balanced meal</b>	Agree	40	40.8
	Disagree	55	56.1
	Neutral	3	3.1
<b>I should eat fruits only when I feel like</b>	Agree	38	38.8
	Disagree	58	59.2
	Neutral	2	2.0
<b>Green leafy vegetables should be taken regularly during pregnancy</b>	Agree	82	83.7
	Disagree	13	13.3
	Neutral	3	3.1
<b>Hygiene is more important than food And nutrition</b>	Agree	41	41.8
	Disagree	48	49.0
	Neutral	9	9.2
<b>Taking supplements is better than eating food</b>	Agree	17	17.3
	Disagree	71	72.4
	Neutral	10	10.2
<b>Processed foods are generally better than raw foods</b>	Agree	15	15.3
	Disagree	65	66.3
	Neutral	18	18.4

deficiency during pregnancy could not affect health status of mother and baby (21.4%) and (29.6%) and (34.7%) were unsure about the sources of proteins and carbohydrates respectively. A large proportion of respondents, (71.4%) expressed high knowledge regarding nutrition during pregnancy compared to (19.4%) and (9.2%) who expressed medium and low knowledge levels respectively.

### 3.4. Nutrition Uptake

As shown in **Table 4**, over one-third of the respondents took less than 3 balanced meals a day, (36.7%) over a quarter, (27.6%) agreed that preparing a balanced meal was time consuming and under half, (40.8%) indicated that knowing how

**Table 4.** Nutrition uptake (n = 98).

Characteristic	Category	Frequency (n)	Percent (%)
Number of meals taken a day	One	8	8.2
	Two	18	18.4
	Three	57	58.2
	Random	15	15.3
Predominant food type consumed	Carbohydrates	52	53.1
	Proteins	16	16.3
	Variety	30	30.6
Current fruit and vegetable intake	Daily	68	69.4
	Weekly	17	17.3
	Occasionally	13	13.3
Alcohol consumption	Yes	11	11.2
During pregnancy	No	87	88.8

to prepare a balanced meal was not important for a pregnant woman. Similarly, respondents agreed that they should eat fruits only when they felt like it (38.8%), green leafy vegetables should be taken regularly during pregnancy (83.7%) and that hygiene was more important than food and nutrition (41.8%). Most respondents disagreed to the views that taking supplements was better than eating actual food (72.4%) and whether processed foods were generally better than raw foods (66.3%). Attitude towards nutrition in pregnancy was positive in the majority, (83.7%) of the respondents, whereas, (16.3%) expressed negative attitude towards nutrition in pregnancy.

### 3.5. Socio-Cultural Practices

**Table 5** shows that over half of the respondents, (58.2%) reported having three meals a day, with carbohydrates being the predominant food type consumed (53.1%). Over two-thirds of the respondents, (69.4%) indicated a daily fruit and vegetable intake and over a tenth, (11.2%) reported alcohol intake during pregnancy. Over half, (55%) of the respondents indicated good nutrition uptake during pregnancy, while under half, (45%) had poor nutrition uptake.

### 3.6. Association between the Variables

**Table 6** shows that about one-third of the respondents, (32.7%) reported cultural restrictions against consumption of certain foods during pregnancy, with traditional/religious beliefs (40.8%) and dislike of certain foods (41.8%) as the main reasons why some foods were not consumed during pregnancy. Under half, (40.8%) of the respondents did not engage in any physical activities during pregnancy.

**Table 5.** Socio-cultural practices (n = 98).

Characteristic	Category	Frequency (n)	Percent (%)
<b>Cultural restrictions against consumption of certain foods during Pregnancy</b>	Yes	32	32.7
	No	66	67.3
<b>Reasons why some foods are not consumed during pregnancy</b>	Traditional/religious beliefs	40	40.8
	Lack of knowledge	3	3.1
	Fear of weight gain	3	3.1
	Medical condition	8	8.2
	Dislike of food	41	41.8
	Vegetarian diet	2	2.0
<b>Involvement in physical activities</b>	Yes	58	59.2
	No	40	40.8

**Table 6.** Association between respondents' demographic characteristics and nutrition uptake.

Variable	Category	Nutrition uptake in pregnancy		P-value
		Good, n (%)	Poor, n (%)	
<b>Age in years</b>	15 - 24 years	19 (50.0)	19 (50.0)	0.724 <sup>FE</sup>
	25 - 34 years	30 (57.7)	22 (42.3)	
	35 - 44 years	5 (62.5)	3 (37.5)	
<b>Marital status</b>	Unmarried	7 (53.8)	6 (46.2)	0.922 <sup>CH</sup>
	Married	47 (55.3)	38 (44.7)	
<b>Education level</b>	Primary	9 (40.9)	13 (59.1)	0.288 <sup>CH</sup>
	Secondary	36 (58.1)	26 (41.9)	
	Tertiary	9 (64.3)	5 (35.7)	
<b>Occupation</b>	Formal	4 (57.1)	3 (42.9)	0.899 <sup>FE</sup>
	Informal	17 (51.5)	16 (48.5)	
	Housewife	33 (56.9)	25 (43.1)	
<b>Wealth Index</b>	High	17 (58.6)	12 (41.4)	0.907 <sup>FE</sup>
	Middle	32 (53.3)	28 (46.7)	
	Low	5 (55.6)	4 (44.4)	
<b>Place of residence</b>	Urban	45 (52.3)	41 (47.7)	0.216 <sup>CH</sup>
	Rural	9 (75.0)	3 (25.0)	
<b>Gestation age</b>	First trimester	11 (68.8)	5 (31.3)	0.417 <sup>CH</sup>
	Second trimester	22 (50.0)	22 (50.0)	
	Third trimester	21 (55.3)	17 (44.7)	
<b>Parity</b>	No children	9 (45.0)	11 (55.0)	0.578 <sup>FE</sup>
	≤4 children	41 (57.7)	30 (42.3)	
	>4 children	4 (57.1)	3 (42.9)	

**Table 7** shows that there was no significant association between nutrition uptake in pregnancy and age ( $p = 0.724$ ), marital status ( $p = 0.922$ ), education level ( $p = 0.288$ ), occupation ( $p = 0.899$ ), wealth index ( $p = 0.907$ ), place of residence ( $p = 0.216$ ), gestation age ( $p = 0.417$ ) and parity ( $p = 0.578$ ).

As shown in **Table 8**, attitude towards nutrition was significantly associated with nutrition uptake in pregnancy ( $p = 0.008$ ). It was observed that more respondents (61%) with a positive attitude towards nutrition had good nutrition uptake during pregnancy compared to those with a negative attitude (25%). Similarly, more respondents (65.5%) who reported engagement in physical activities had good nutrition uptake compared to those who did not engage in physical activity (40%). This difference was statistically significant ( $p = 0.014$ ). **Table 7** further shows that there was no significant association between knowledge ( $p$

**Table 7.** Association between knowledge, attitude, socio-cultural factors and nutrition uptake.

Variable	Category	Nutrition uptake in pregnancy		P-value
		Good, n (%)	Poor, n (%)	
Age in years	15 - 24 years	19 (50.0)	19 (50.0)	0.724 <sup>FE</sup>
	25 - 34 years	30 (57.7)	22 (42.3)	
	35 - 44 years	5 (62.5)	3 (37.5)	
Marital status	Unmarried	7 (53.8)	6 (46.2)	0.922 <sup>CH</sup>
	Married	47 (55.3)	38 (44.7)	
Education level	Primary	9 (40.9)	13 (59.1)	0.288 <sup>CH</sup>
	Secondary	36 (58.1)	26 (41.9)	
	Tertiary	9 (64.3)	5 (35.7)	
Occupation	Formal	4 (57.1)	3 (42.9)	0.899 <sup>FE</sup>
	Informal	17 (51.5)	16 (48.5)	
	Housewife	33 (56.9)	25 (43.1)	
Wealth Index	High	17 (58.6)	12 (41.4)	0.907 <sup>FE</sup>
	Middle	32 (53.3)	28 (46.7)	
	Low	5 (55.6)	4 (44.4)	
Place of residence	Urban	45 (52.3)	41 (47.7)	0.216 <sup>CH</sup>
	Rural	9 (75.0)	3 (25.0)	
Gestation age	First trimester	11 (68.8)	5 (31.3)	0.417 <sup>CH</sup>
	Second trimester	22 (50.0)	22 (50.0)	
	Third trimester	21 (55.3)	17 (44.7)	
Parity	No children	9 (45.0)	11 (55.0)	0.578 <sup>FE</sup>
	≤4 children	41 (57.7)	30 (42.3)	
	>4 children	4 (57.1)	3 (42.9)	

**Table 8.** Association between knowledge, attitude, socio-cultural factors and nutrition uptake during pregnancy.

Variable	Category	Nutrition uptake in pregnancy		P-value
		Good, n (%)	Poor, n (%)	
Knowledge on nutrition during pregnancy	Low	5 (55.6)	4 (44.4)	0.200 <sup>FE</sup>
	Medium	7 (36.8)	12 (63.2)	
	High	42 (60.0)	28 (40.0)	
Attitudes towards nutrition	Positive	50 (61.0)	32 (39.0)	0.008 <sup>CH</sup>
	Negative	4 (25.0)	12 (75.0)	
Cultural restrictions against consumption of certain foods	Yes	14 (43.8)	18 (56.3)	0.116 <sup>CH</sup>
	No	40 (60.6%)	26 (39.4)	
Engagement in physical activity	Yes	38 (65.5)	20 (34.5)	0.014 <sup>CH</sup>
	No	16 (40.0)	24 (60.0)	

= 0.200), cultural restrictions ( $p = 0.116$ ) and nutrition uptake in pregnancy.

**Table 9** shows that at both univariable and multivariable logistic regression analysis on physical activity and attitude towards nutrition had a significant effect on nutrition uptake during pregnancy. Respondents who engaged in physical activities compared to those who didn't have 2.85 times higher odds of nutrition uptake during pregnancy at univariable analysis ( $cOR = 2.85$ , 95% CI = 1.24, 6.55,  $p = 0.014$ ) and 3.27 times higher odds at multivariable analysis ( $aOR = 3.27$ , 95% CI = 1.23, 8.70,  $p = 0.018$ ).

Having a negative attitude towards nutrition compared to positive attitude was significantly associated with 79% lower odds of nutrition uptake during pregnancy at univariable analysis ( $cOR = 0.21$ , 95% CI = 0.06, 0.72,  $p = 0.013$ ) and 80% lower odds at multivariable analysis ( $aOR = 0.20$ , 95% CI = 0.05, 0.85,  $p = 0.029$ ). Knowledge and cultural restrictions on nutrition showed decreasing effects on nutrition uptake during pregnancy, however, these effects were not significant ( $p$ -values > 0.05). Similarly, the effects of age, residence and gestation age had no significant effect on nutrition uptake during pregnancy ( $p$ -values > 0.05).

## 4. Discussion of Findings

### 4.1. Characteristics of the Respondents

In the age, marital status, level of education, occupation and wealth index were elicited. The findings showed that about half of the respondents were aged between 25 to 34 years an indication that the majority were young adults (**Table 1**). A large percentage of the pregnant women were married which could be attributed to the fact that childbearing is mostly inclined and acceptable to married women in most societies and communities. The majority of the respondents had secondary school education which could be because most women attach more

**Table 9.** Univariable and multivariable logistic regression analysis results on nutrition uptake during pregnancy.

Variables	Univariable analysis			Multivariable analysis		
	cOR	CI (95%)	p-value	aOR	CI (95%)	p-value
<b>Age group</b>						
15 - 24 years	Ref			Ref		
25 - 34 years	1.36	0.59, 3.16	0.470	1.11	0.42, 2.94	0.833
35 - 44 years	1.67	0.35, 7.89	0.523	1.04	0.18, 6.16	0.964
<b>Residence</b>						
Urban	Ref			Ref		
Rural	2.73	0.69, 10.8	0.151	3.54	0.80, 15.7	0.097
<b>Gestation age</b>						
First	Ref			Ref		
Second	0.45	0.14, 1.53	0.202	0.27	0.06, 1.15	0.076
Married	0.56	0.16, 1.93	0.360	0.37	0.08, 1.59	0.179
<b>Physical activity</b>						
No	Ref			Ref		
Yes	2.85	1.24, 6.55	0.014	3.27	1.23, 8.70	0.018
<b>Cultural nutrition restrictions</b>						
No	Ref			Ref		
Yes	0.51	0.21, 1.19	0.118	0.64	0.22, 1.84	0.405
<b>Knowledge level</b>						
Low	Ref			Ref		
Medium	0.47	0.09, 2.34	0.354	0.32	0.04, 2.28	0.253
High	1.20	0.30, 4.86	0.798	0.77	0.14, 4.28	0.765
<b>Attitude</b>						
Positive	Ref			Ref		
Negative	0.21	0.06, 0.72	0.013	0.20	0.05, 0.85	0.029

importance to marriage than attainment of tertiary education as depicted in (Table 1) The modal occupation of the respondents was housewifery which accounted for about half of the respondents, which is in line with the stereotypical gender roles that is associated with gendered social norms, marriage too often keeps women out of the labour force [7] Most (61.2%) of the pregnant women were from the middle class (Table 1) as this could be associated with the fact that Solwezi district is primarily a peri-urban area.

The pregnancy and nutrition related characteristics of the respondents which were measured included the gestational age (Table 1). This was measured in or-

der to determine whether gestational age had an influence on nutrition uptake by pregnant women. The findings showed that majority of the pregnant women (though less than half) were in their second trimester of pregnancy which would be attributed to the fact that most of the pregnant women get actively involved in seeking ANC services during this gestational age. With regards to the parity, the majority of the respondents had no more than 4 children (**Table 1**), which is in line with the finding of the research which was conducted in a marginalized areas of Sri Lanka which illustrated highly significant positive correlation between nutritional knowledge, attitude score, and BMI level and a significant difference was found in the area, age, family size, monthly income, educational level, attitudes towards nutrition, food and nutrition practices across the reproductive women [8].

#### 4.2. Knowledge Level

The pregnant women's knowledge levels regarding nutrition in pregnancy are depicted in **Table 2**, the majority of respondents agreed that a balanced diet is necessary during, good nutrition during pregnancy is necessary for foetal development and that sources of vitamins and minerals are fruits and vegetables, milk which is line with the studies that were carried in Egypt and Ethiopia where the study participants mentioned the importance of a higher recommended intake of "vitamins," "good", and "beneficial" foods and quality of diet (*i.e.*, consuming vegetables, fruits, meat, and fish) during pregnancy [8].

The study also revealed that the majority most respondents indicated that women's nutrition requirements increases during pregnancy and that being underweight during pregnancy can affect baby's well-being and growth (**Table 2**). On the other hand, around a quarter, reported that obesity during pregnancy did not increase the risk of pregnancy problems, nutrition deficiency during pregnancy could not affect health status of mother and baby and some of the respondents were unsure about the sources of proteins and carbohydrates respectfully.

A large proportion of respondents, expressed high knowledge regarding nutrition during pregnancy compared to who expressed medium and low knowledge levels respectively. Similar findings were also reported in a study conducted in Cameroon by Suh *et al.* [9] on knowledge and attitudes of pregnant mothers towards maternal dietary practices during pregnancy at the Etoug-Ebe Baptist Hospital Yaounde. The study concluded that pregnant mothers in Yaounde had satisfactory knowledge of nutrition in pregnancy. Furthermore, the current findings also correspond with the findings from a community based cross sectional study by [10] in North-western Ethiopia.

#### 4.3. Pregnant Women's Attitude towards Nutrition in Solwezi District

The findings of the study indicate that (**Table 3**), over one-third of the respondents took less than 3 balanced meals a day, slightly above a quarter of the respondents agreed that preparing a balanced meal was time consuming and under

half, and almost half of the pregnant women indicated that knowing how to prepare a balanced meal was not important for a pregnant woman. Furthermore, the study revealed that some respondents agreed that they should eat fruits only when they felt like it, the majority of the respondents indicated that green leafy vegetables should be taken regularly during pregnancy and almost half of the pregnant women that hygiene was more important than food and nutrition.

The study findings also show that most of the respondents disagreed with the views that taking supplements was better than eating actual food and also that processed foods were generally better than raw foods. Attitude towards nutrition in pregnancy was positive in the majority of the respondents, compared to those who expressed negative attitude towards nutrition in pregnancy. The findings of the present study are in line with a cross-sectional study that was conducted with the aim of determining the knowledge, attitude and practice (KAP) of pregnant women regarding nutrition during pregnancy in Yazd [11] which reported positive attitude towards nutrition. Similar findings were reported in another Nigerian study by Okunaiyi [12] conducted among Pregnant Women in Urban slums of Lagos State, which revealed that most of the participants had positive attitudes towards nutrition. Furthermore, a Swaziland study revealed the majority of the respondents had positive nutrition attitudes. Contrary to this study finding a study which was conducted in Rwanda [13] which concluded that most of the participants had negative attitudes and poor nutrition practices.

#### 4.4. Uptake during Pregnancy

The findings as indicated in **Table 4** shows that over half of the respondents, reported having three meals a day, with carbohydrates being the predominant type of food consumed). Over two-thirds of the respondents, indicated a daily fruit and vegetable intake and over a tenth, reported alcohol intake during pregnancy. This is similar to the study findings [9] in Cameroonian which revealed that less than half of the participants knew that they should eat 3 main meals a day, but only a few of them practiced it and that the majority of the mothers had cited the correct components of a balanced diet and their food sources however, slightly above half of them had an aversion towards foods rich in protein and other important nutrients.

The study findings further more indicate that slightly above half, of the respondents had good nutrition uptake during pregnancy, while almost half of the pregnant women had poor nutrition uptake. The study findings are contrary to the study findings [10] in Ethiopia revealed that less than half of the study participants had good dietary practices and the majority of the pregnant women reported poor dietary practices and the study findings [11] in Iran found that the nutrition practice of most of the respondents was moderate about nutrition during pregnancy. Spronk *et al.* reported that food choices were influenced by knowledge of nutrition which might influence nutritional status of individu-



als. This is consistent studies have reported significant association between nutritional knowledge and dietary intake which was similarly reported by other researchers that increased nutritional knowledge. improves food consumption practices.

#### **4.5. Social-Cultural Practices**

The study findings also revealed as indicated in **Table 5** that about one-third of respondents, less than half had reported cultural restrictions against consumption of certain foods during pregnancy, with traditional/religious beliefs and dislike of certain foods accounting for almost half of the respondents as the main reasons why some foods were not consumed during pregnancy. This is Congruent with other studies, which mentioned reasons for food taboos such as fear of delivering a big baby, and cultural prohibitions of eating certain food during pregnancy. The majority of the respondents in this study raised similar reason for food taboos as of the findings obtained in the studies study conducted in Sudan, South Africa, and Ghana which revealed that the most common perceived reasons for avoiding foods were fear of born a baby with deformities and fear of difficult of delivering big baby.

The study also revealed that less than half of the respondents, did not engage in any physical activities during pregnancy. The findings are in line with the study which was conducted in Indonesia [12] on factors affecting maternal nutrition and health with an assumption that maternal nutrition practices, access to resources and food distribution systems which indicated that, despite the fairly balanced social status of Minang women due to the matrilineal traditions in their households and the community, the impact of health inequalities on women's health remains a challenge. Issues such as poverty, access to food and adequate/appropriate nutritional information during pregnancy seem to be the major challenges for pregnant mothers and their families.

#### **4.6. Association between Variables**

The study findings further indicate the results from the analysis of association between study variables which was done to establish the associations between the dependent variable; nutrition uptake during pregnancy was cross tabulated with independent variables; demographic characteristics; knowledge, attitude and socio-cultural factors. Results are shown in **Table 6** revealed that there was no significant association between nutrition uptake in pregnancy and demographic characteristics of respondents such as age, marital status, education level, occupation wealth index of residence, gestation age and parity which contrary to the research findings [13] in Kenya which demonstrated that maternal education level was positively associated with health and nutrition knowledge, health attitudes, and dietary diversity and also to a similar study conducted [14] in Ethiopia which illustrated that demographic characteristic was significantly associated with occurrence of anemia which is predominantly caused by micronu-

trient deficiency and maternal undernutrition.

As shown in **Table 7**, attitude towards nutrition was significantly associated with nutrient uptake in pregnancy. It was observed that most of the respondents who had a positive attitude towards nutrition had good nutrition uptake during pregnancy compared to those with a negative attitude which is in line with the study findings [15] in China which depicted that Nutritional Knowledge and Nutritional Attitude were statistically significant predictors of the vulnerable group. The study has shown that more than half of the respondents who reported engagement in physical activities had good nutrition uptake compared to those who did not engage in physical activity whose difference was statistically significant this is similar to the study finding obtained in a study conducted [16] in China which observed association with fruit and vegetable intake, fruit juice was also positively associated with physical activities among boys and girls. The findings were also in line with the study result of the study which was conducted in [17] which illustrated an association between various exercise types and intake of specific nutrients.

**Table 8** shows that there was no significant association between knowledge and nutrition uptake, this is contrary to the findings of the study which was conducted in Sri Lanka which reported significant association between Nutritional Knowledge and dietary intake which is in line with similar reports by other researchers which state that increased nutritional knowledge improves food consumption practices [18]. Furthermore, the study has demonstrated that there was no significant association between cultural restrictions and nutrition uptake in pregnancy the findings are not consistent with the study findings of a study conducted in Ethiopia which reported that pregnancy-related food taboos were more likely among women who had fear of delivering a big baby, fear of causing fetal anomaly/deformities or harming the newborns, and cultural prohibition were some of the most frequently reported perceived reasons by pregnant women for their food taboos [5]

#### 4.7. Univariable and Multivariable Logistic Regression Analysis

The study findings also present the results from univariable and multivariable logistic regression analysis models. This adopted variables for the multivariable analysis, an investigator guided backward stepwise approach was adopted. **Table 9** on page 37 shows that at both univariable and multivariable, physical activity and attitude towards nutrition had a significant effect on nutrition uptake during pregnancy. this is in line the study findings which state that nutritional knowledge was positively associated with dietary intakes of leafy vegetables, salads and sprouts but negatively associated with fruit intake [19]. The study has revealed that the having a negative attitude towards nutrition compared to positive attitude was significantly associated with nutrition uptake during pregnancy at univariable this is consistent with the conclusion of the study conducted [20] in Czech Republic which stated that nutritional knowledge is one of the corner-

stones of health literacy, which represents the ability to acquire, understand, and use information that ultimately leads to an increase in one's own influence on the quality of health. Nutritional knowledge itself will not completely influence an individual's behaviour, but it can significantly shape their attitudes, which can be reflected in a person's actions. Knowledge and cultural restrictions on nutrition showed decreasing effects on nutrition uptake during pregnancy, however, these effects were not significant and similarly, the effects of age, residence and gestation age had no significant effect on nutrition uptake during pregnancy.

## 5. Conclusions

The study on nutrition uptake among pregnant women was conducted in Solwezi district of north-western province of Zambia has demonstrated that the pregnancy and nutrition related characteristics of the respondents which were measured in order to determine whether gestational age had an influence on nutrition uptake by pregnant women. The findings showed that most pregnant women were actively seeking antenatal care in their third trimester which represented slightly above fifty percent with regards to the respondents' parity, the study revealed that most of the respondents had less than four children.

A large proportion of respondents expressed high knowledge levels regarding nutrition during pregnancy and most of the respondents had a positive attitude towards nutrition in pregnancy. The study findings further more indicate as shown that only slightly half of the respondents had good nutrition uptake during pregnancy while the almost half had shown poor nutrition uptake during pregnancy which calls for more consented efforts in behavioural change messages, education and communication which will in turn help to translate knowledge and attitude into appropriate nutrition uptake among pregnant women. The study findings also revealed that about one-third of the respondents, reported cultural restrictions against consumption of certain foods during pregnancy, while less than half of the respondents' had revealed that traditional/religious beliefs and dislike of certain foods are the main reasons why some foods were not consumed during pregnancy. This calls for more intense collaboration with key stakeholders like traditional leaders, faith based organisations and neighbourhood health committees to work together with the Ministry of Health in order to mitigate on inappropriate traditional beliefs and practices which have a negative impact on maternal nutrition.

The study findings further revealed the association between the dependent variable; nutrition uptake during pregnancy which was cross tabulated with independent variables; demographic characteristics; knowledge, attitude and socio-cultural factors. The results revealed that there was no significant association between nutrition uptake in pregnancy and demographic characteristic. The study findings revealed that attitude towards nutrition was significantly associated with nutrient uptake in pregnancy. It also showed that more respondents

who had positive attitude towards nutrition had good nutrition uptake during pregnancy compared to those with a negative attitude. The study findings also show that at both univariable and multivariable analysis on physical activity and attitude towards nutrition had a significant effect on uptake of essential nutrition during pregnancy. Having a negative attitude towards nutrition compared to positive attitude was significantly associated with nutrition uptake during pregnancy at univariable analysis. Knowledge and cultural restrictions on nutrition showed decreasing effects on nutrition uptake during pregnancy.

The current study on nutrition uptake in pregnancy was significantly associated with women's attitude towards nutrition. It was also observed that more respondents who had a positive attitude towards nutrition had nutrition uptake during pregnancy compared to those with a negative attitude. We can therefore, conclude that the research study has revealed that the majority of the respondents had high knowledge level and positive attitude towards nutrition during pregnancy, but however, only about half of the respondents had good nutrition uptake during pregnancy which should be able to prompt all the stakeholders of health to focus their attention on behavioural change messages, policies and intervention in order to enhance good nutrition uptake among pregnant women.

## 6. Recommendations

The following recommendations have been made based on the findings of the current study:

- 1) There is need for the Ministry of Health to strengthen the existing antenatal care services and the integration of nutrition health services for pregnant women as it has the potential to improve the nutritional health status of pregnant women which will in turn help to reduce maternal and perinatal morbidity and mortality in Zambia.
- 2) The Ministry of Health should be able to able to strengthen community participation by engaging with gate keepers like the community leaders and faith based organization in the promotion of maternal nutrition in order to counter socio-cultural barrier to nutritional uptake during pregnancy.
- 3) The social media should also be used to disseminate behavioral change messages on nutrition uptake during pregnancy in order to promote positive attitude and good nutrition practices during pregnancy.
- 4) The Ministry of health should be able to collaborate with other stakeholders in order to come up with policy guidelines that will aim at improving the nutritional uptake by pregnant. This can be done by promoting women's education, strengthening sustainable income generating activities that can improve and empower women in order to support the wealth status of women in Zambia that will eventually translate into improved nutrition during pregnancy and the entire life cycle.
- 5) They should be able to come up with written protocols on the promotion on good nutrition during pregnancy which should be displayed in the health fa-

cilities to serve as a guide to the health care providers.

6) Furthermore, they should be able to formulate guidelines which should be distributed in the health facilities for to act as a guide for the nurses and midwives to follow in order to improve maternal nutrition service provision for improved maternal nutritional uptake.

7) The Ministry of Health (MOH) should also come up with policies and programs that should be able to promote pre-conception nutrition among adolescents and young women which in turn will be able to increase knowledge levels on nutrition and promote positive attitude toward nutritional uptake during pregnancy.

8) There is also need to focus on WHO guidelines on iron and folic acid supplementation in non-pregnant adolescent girls and women which refer to the need for behaviour change communication to improve the acceptability of and adherence to supplementation as this is not being implemented in Zambia.

9) They should also introduce in-service capacity building programs that should enhance skill and competency empowerment for the nurses and midwives with up-to-date evidence-based practice which in turn would improve behavioural change communication among women with regards to nutritional uptake during pregnancy.

10) There is need to improve on the quality of in-service training programs in maternal nutritional uptake among nurses and midwives and to intensify the training of health care providers, in counselling on what foods to consume during pregnancy based on the necessary energy, protein, micronutrients, and fatty acids which should include fortified staple foods and condiments according to local cultural context (USAID, 2015).

11) The Ministry of Health should strengthen the existing continuous training of health care professionals particularly midwives and nurses in programs that promote maternal nutritional uptake.

12) The ministry should also strengthen the existing maternal nutrition programs which are within the context of infant and young child feeding counselling provided at the community level through platforms such as the Baby-Friendly Initiative (UNICEF 2016).

13) The nurses and midwives should pay more attention and allocate sufficient time to the counselling and education of women in the reproductive age on the importance of healthy nutrition uptake during pregnancy in order to prevent maternal undernutrition.

14) Adequate counselling of pregnant women on the dangers of maternal undernutrition should be considered an essential component of the ANC service package in order to ensure good nutrition uptake among pregnant women. The ministry should also ensure that information, education and communication (IEC) materials are made readily available in the seven major languages of Zambia in order to foster communication and awareness creation on the importance of health nutrition uptake during pregnancy.

15) The Ministry of Health and other stakeholders should ensure that enough education resources are made available in the health institution in order to en-

hance the quality of behavioural change counselling among pregnant women by the nurses and midwives.

#### **Future Research should be able to focus on:**

16) Eliciting whether nutrition information given to pregnant women during preconception and antenatal care by nurses and midwives is adequate to impart knowledge levels and promote positive attitude towards nutritional uptake among pregnant women which should in turn improve their health and nutritional status as well as that of their children.

17) To explore the education, information and competences on the education received by nurses and midwives during training in school with regards to nutritional uptake during the preconception and pregnancy period as this will help to ensure that nurses and midwives are well equipped with knowledge and competences on how to promote good nutritional uptake among pregnant women.

18) To conduct a similar study on a large scale in order to generalize of the findings.

### **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

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