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Factors Associated with Failure to Achieve Minimum Dietary Diversity among Women and Children under Five Years in Yangambi, Democratic Republic of the Congo

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Abstract

Introduction: Food insecurity remains a major public health problem worldwide, characterized not only by insufficient food intake but also by low dietary diversity. This situation particularly affects women and children under five years of age and constitutes a major determinant of malnutrition. In the Democratic Republic of the Congo, low dietary diversity remains common, especially in rural settings such as Yangambi. This study aimed to analyze the factors associated with failure to achieve minimum dietary diversity among women and children under five years of age in Yangambi. **Methods:** This analytical cross-esctional study was conducted from january to april 2026 in Yangambi, Tshopo province, Democratic Republic of the Congo. This study included 614 women and their children under five years of age selected using a two-stage cluster probability sampling method. Sociodemographic, socioeconomic, environmental, and dietary date were collected using a structural questionnaire. Data were analyzed using STATA version 13. Associations between dependent and independent variables were assessed using binary logistic regression. Results were expressed as Odds Ratios (Ors) with 95% confidence intervals, and statistical significance was set at $p < 0.05$. **Results:** A total of 614 women and their children under five years of age were included in the study. Failure to achieve minimum dietary diversity was observed among 55.54% of women and 84.53% of children. After multivariate adjustment, the main factors associated with failure to achieve minimum dietary diversity were the educational level of the household head, marital status of the household

head, woman's age, woman's physiological status, child's age, amount spent on food, and household hunger index. **Conclusion:** Failure to achieve minimum dietary diversity remains high among women and children under five years of age in Yangambi. It is mainly associated with several sociodemographic, nutritional, and socioeconomic factors. Strengthening nutritional interventions and food security programs targeting vulnerable households appears necessary to improve dietary diversity in rural areas of the Democratic Republic of the Congo.

Keywords

Minimum Dietary Diversity, Women, Children under Five Years of Age, Associated Factors, Democratic Republic of the Congo, Yangambi

1. Introduction

Food and nutritional insecurity remain a major public health concern worldwide, currently exacerbated by economic crises and climate disruptions [1] [2]. Food insecurity is not limited to insufficient food intake but also includes the consumption of poor-quality and undiversified diets [3]. Low dietary diversity is a major determinant of malnutrition, particularly among women and children under five years of age [4]-[6]. Recent evidence from low- and middle-income countries has shown that higher dietary diversity is strongly associated with improved micronutrient adequacy, better nutritional status, and overall health outcomes among women and children [7]-[9].

Globally, approximately two billion people suffer from micronutrient deficiencies, a large proportion of which is linked to monotonous diets [10]. In sub-Saharan Africa, the prevalence of low dietary diversity remains high, affecting approximately 22.5% of the population in 2022 [10] [11]. Recent studies conducted in sub-Saharan Africa have consistently reported low dietary diversity among women and children, particularly in rural settings where poverty, food insecurity, and limited access to diversified foods remain major challenges [7] [12] [13]. According to the 2023 IPC analysis, the Democratic Republic of the Congo (DRC) continues to be severely affected by chronic food and nutritional insecurity, with 40% of the population identified as vulnerable [14]. Studies conducted in 2014 and 2018 showed that more than 80% of children aged 6 - 23 months did not meet the minimum dietary diversity [15].

In Yangambi, difficult socioeconomic conditions directly contribute to inadequate and poorly diversified diets among women and children [14]. For women, minimum dietary diversity is defined as the consumption of at least five food groups, while for children, dietary diversity reflects the variety of food groups consumed during the previous 24 hours and is commonly used as an indicator of dietary quality and nutrient adequacy [4].

Although the relationship between various factors and dietary diversity has

been documented at the international level and in several African countries, few studies have specifically explored the factors associated with minimum dietary diversity in local contexts in the DRC [12] [16] [17]. This study aims to analyze the factors associated with failure to achieve minimum dietary diversity among women and children under five years of age in the town of Yangambi, Democratic Republic of the Congo.

2. Methodes

Study Setting: The study was conducted in the town of Yangambi, located in Tshopo Province, Democratic Republic of the Congo [18]. The town is predominantly agricultural, and the population mainly relies on subsistence farming, livestock rearing, fishing, and small-scale trade [12].

Study Population: The study population consisted of women and children under five years of age living in households in Yangambi.

Study Period: The study was conducted between January and April 2026.

Study Design: This was an analytical cross-sectional study aimed at analyzing the factors associated with failure to achieve minimum dietary diversity among women and children under five years of age in Yangambi.

Sampling: A two-stage cluster probability sampling method was used. Accessible villages were defined as villages that could be reached during the study period and where household enumeration was feasible. Villages were randomly selected from the list of eligible villages in Yangambi to constitute the study clusters. Within each selected cluster, households were selected using a systematic sampling procedure. In households with more than one eligible child under five years of age, one child was selected randomly to avoid intra-household clustering. A total of 614 households meeting the inclusion criteria were ultimately enrolled in the study.

Sample Size: The sample size was calculated using Cochran's formula, based on a prevalence of 41% of chronic food insecurity reported by the IPC 2023 in the DRC, with a precision of 5% and a 95% confidence interval. After accounting for a design effect of 1.5 and a 10% non-response rate, the final sample size was 614 women from 614 households, each with one child under five years, distributed across 30 clusters of 20 households each.

Inclusion and Exclusion Criteria: Women and children under five years living in the selected households who provided consent to participate and whose household heads gave authorization were included in the study.

Data Collection: Data were collected using a structured questionnaire covering the sociodemographic, socioeconomic, environmental, and dietary characteristics of women and children under five years. Dietary diversity was assessed using a 24-hour dietary recall method. For women, minimum dietary diversity was defined according to the FAO Minimum Dietary Diversity for Women (MDD-W) guideline as the consumption of at least five out of ten food groups during the previous 24 hours. The food groups included: grains, roots and tubers; pulses; nuts and

seeds; dairy products; meat, poultry and fish; eggs; dark green leafy vegetables; vitamin A-rich fruits and vegetables; other vegetables; and other fruits.

For children, dietary diversity was assessed based on the number of food groups consumed during the previous 24 hours. Infants aged 0 - 5 months were excluded from dietary diversity assessment because WHO recommendations promote exclusive breastfeeding during the first six months of life, making dietary diversity indicators not applicable to this age group. Therefore, dietary diversity analysis was restricted to children aged 6 - 59 months. In this study, consumption of at least five food groups was considered adequate dietary diversity among children. The dietary diversity assessment among children aged 24 - 59 months was performed to explore dietary patterns among all preschool children in the study area, where malnutrition remains highly prevalent.

Data Processing and Statistical Analysis: Data were entered into Excel and analyzed using STATA version 13. Categorical variables were presented as frequencies and percentages, while quantitative variables were summarized as means ± standard deviations or medians with interquartile ranges. Associations between dependent and independent variables were assessed using binary logistic regression. Results were expressed as crude and adjusted Odds Ratios (OR) with 95% confidence intervals. Statistical significance was set at $p < 0.05$.

Ethical Considerations and Conflicts of Interest: The study was approved by the Ethics Committee of the Faculty of Medicine, University of Kisangani. Administrative authorizations were obtained from local authorities. Informed consent was obtained from participants prior to data collection. Data were anonymized and handled confidentially. The authors declare no conflicts of interest.

3. Results

Sociodemographic, socioeconomic, and environmental characteristics of the surveyed households.

Table 1 presents the sociodemographic, socioeconomic, environmental, and nutritional characteristics of the respondents. The mean age of household heads was 40.70 ± 11.71 years, and 88.27% of households were headed by men. More than half of the women did not achieve the minimum dietary diversity (55.5%), while this proportion reached 84.5% among children under five years of age. Infants aged 0 - 5 months were excluded from dietary diversity analyses because they were expected to be exclusively breastfed according to WHO recommendations.

Table 1. Sociodemographic, socioeconomic, environmental, and nutritional characteristics of the respondents.

Variables		N = 614	(%)
Sociodemographic characteristics Age of household head (years) Mean ± SD	40.7 ± 11.7 (18 - 71)		
	<29	117	19.06
	30 - 44	269	43.81
	45 - 59	183	29.8
	≥60	43	7.33

Continued

Sex of household head	Female	72	11.73
	Male	542	88.27
Educational level of household head	None	104	16.94
	Primary	307	50
	Secondary	172	28.01
	Higher	31	5.05
Occupation of household head	Agriculture	308	50.16
	Public sector employee	65	10.59
	Trader	64	10.42
	Fishing	49	7.98
	Artisan	39	6.35
	Livestock farming	31	5.05
	Hunting	28	4.56
	Forest exploitation	23	3.75
	Public sector retiree	7	1.14
Marital status of household head	Monogamous	430	70.03
	Polygamous	111	18.08
	Separated	39	6.35
	Widowed	34	5.54
Woman's age (years) Median (P25–P75)	32 (25 - 41)		
	<29	255	41.53
	30 - 44	249	40.55
	45 - 59	91	14.82
	≥60	19	3,09
Woman's physiological status	Pregnant	115	18.729
	Lactating	184	29.967
	Non-pregnant, non-lactating (NPNL)	315	51.302
Child's age < 5 years Median (P25 - P75)	29 (8 - 47)		
	0 - 5 months	125	20,36
	6 - 11 months	48	9.82
	12 - 23 months	100	20.45
	24 - 59 months	341	69.73
Household size	6.118 ± 1.665 (2 - 10)		
	≤4	154	25.08
	5 - 7	323	52.61
	≥8	137	22.31

Continued

Household status	Non-native	215	35.02
	Native	399	64.98
Village of household origin	Yalikombo	164	26.71
	Yaselia	142	23.13
	Lilanda	114	18.57
	Weko	70	11.4
	Yaekama	69	11.24
	Yalisombo	55	8.96
Socioeconomic characteristics Average monthly household income	75,000 [50,000 - 150,000] (30,000 - 350,000)		
	<75,000 FC	325	52.93
	76,000 - 200,000 FC	257	41.86
	>201,000 FC	32	5.21
Child contributing to household income	No	261	42.51
	Yes	353	57.49
Main source of household income	Agricultural products		
	(V + P)	307	50
	Salary	65	10.59
	Trade	64	10.42
	Fishing (V)	49	7.98
	Artisan work	39	6.35
	Livestock (V + P)	32	5.21
	Hunting (V)	28	4.56
	Gathering + firewood	23	3.75
	Aid/donations	7	1.14
Trend in annual household income	Decreased	539	87.79
	Stable	63	10.26
	Increased	12	1.95
Estimated amount spent on food (FC)	40000 [23,000 - 60,000] (10,000 - 130,000)		
	<20,000 FC	117	19.06
	20,000 - 50,000 FC	275	44.79
	>50,000 FC	222	36.16
Main use of household income	Direct food consumption	228	37.13
	Sale to purchase food	146	23.78
	Men's personal needs	60	9.77

Continued

	Children's education	46	7.49
	Purchase of household goods	43	7.00
	Family health care	43	7.00
	Purchase of clothing	36	5.86
	Debt repayment	12	1.95
Environmental characteristics Access to safe drinking water	No	397	64.66
	Yes	217	35.34
Main source of drinking water	River water	220	35.83
	Pumped borehole	217	35.34
	Unprotected well	103	16.78
	Locally protected well	74	12.05
Nutritional characteristics Minimum dietary diversity for women	4 [3 - 6] (2 - 9)		
	Not achieved (<5)	341	55.54
	Achieved (≥5)	273	44.46
Minimum dietary diversity for children	3 [2 - 4] (1 - 7)		
	Not achieved (<5)	519	84.53
	Achieved (≥5)	95	15.47
Household hunger scale	1 [0 - 3] (0 - 6)		
	Little to no hunger (0 - 1)	340	55.37
	Moderate hunger (2 - 3)	130	21.17
	Severe hunger (4 - 6)	144	23.45
Nutritional status of women	25.3 [23.6 - 26.1] (20.1 - 26.36)		
	Normal	505	82.25
	MAM	102	16.61
	SAM	7	1.14
Nutritional status of children	12.6 [12 - 13] (11 - 22.6)		
	Normal	328	53.42
	MAM	244	39.74
	SAM	42	6.84

Moderate or severe hunger affected 44.6% of households. More than half of the households had a monthly income below 75,000 Congolese francs (52.93%), with a median monthly income of 75,000 francs (interquartile range: 50,000 - 150,000 francs). Over half of the children under 18 years contributed to household income (57.49%), and the majority of households (87.79%) reported a decrease in their income compared to the previous year.

Agriculture was the main source of household income for half of the households (50.00%). Some households spent less than 20,000 Congolese francs per month on food (19.06%), with a median monthly food expenditure of 40,000 francs (interquartile range: 23,000 - 60,000 francs). Additionally, 37.13% of households primarily used their income for direct food consumption.

More than half of the households lacked access to safe drinking water (64.66%). The main sources of water supply were river water (35.83%) and pumped boreholes (35.34%). More than half of the women did not achieve minimum dietary diversity (55.54%), with a median dietary diversity score of 4 (interquartile range: 3 - 6; range: 2 - 9 food groups). Among children under five years, 84.53% did not meet the minimum dietary diversity, with a median score of 3 (interquartile range: 2 - 5; range: 1 - 7 food groups).

Regarding nutritional status, global acute malnutrition (moderate and severe acute malnutrition) affected 17.75% of women and 46.58% of children under five years of age. Multivariate logistic regression of factors associated with minimum dietary diversity among women.

Table 2 presents the factors associated with minimum dietary diversity among women after multivariate logistic regression. After adjustment, the educational level of the household head remained significantly associated with women's minimum dietary diversity. Only women whose household heads had a higher education level were 22 times more likely to achieve minimum dietary diversity (aOR = 21.88; 95% CI: 4.13 - 115.97; $p < 0.001$) compared to those whose household heads had no formal education. However, primary ($p = 0.416$) and secondary ($p = 0.066$) education levels showed no significant association with women's minimum dietary diversity after adjustment.

Table 2. Factors associated with minimum dietary diversity among women (multivariate logistic regression).

Variables	n (%)	Crude OR (95% CI)	p-Value	Adjusted OR (95% CI)	p-Value
Educational level					
Primary	307 (50.00)	2.15 (1.33 - 3.48)	0.002	1.31 (0.68 - 2.50)	0.416
Secondary	172 (28.01)	1.73 (1.03 - 2.92)	0.039	2.13 (0.95 - 4.74)	0.066
Higher	31 (5.05)	35.77 (8.03 - 159.40)	<0.001	21.88 (4.13 - 115.97)	<0.001
Marital status of household head					
Polygamous	111 (18.08)	1.89 (1.24 - 2.89)	0.004	2.09 (1.23 - 3.56)	0.007
Separated	39 (6.35)	0.51 (0.25 - 1.04)	0.245	0.77 (0.33 - 1.83)	0.77
Widowed	34 (5.54)	0.41 (0.18 - 0.89)	0.026	0.72 (0.23 - 2.21)	0.562
Woman's age (years)					
30 - 44	249 (40.55)	1.44 (1.01 - 2.05)	0.042	1.70 (1.06 - 2.73)	0.027
45 - 59	91 (14,82)	1.39 (0.086 - 2.25)	0.182	3.32 (1.62 - 6.78)	0.001
≥60	19 (3.09)	1.72 (0,68 - 4,39)	0.254	11.52 (3.31 - 40.11)	<0.001

Continued

Woman's physiological status					
Vulnerable (pregnant or lactating)	299 (48.71)	2.06 (1.49 - 2.84)	<0.001	3.41 (2.19 - 5.31)	<0.001
Household hunger index					
Hunger	274 (44.63)	0.22 (0.15 - 0.31)	<0.001	0.23 (0.15 - 0.34)	<0.001
Type of drinking water source					
Pumped borehole	217 (35.34)	1.69 (1.16 - 2.48)	0.007	0.75 (0.42 - 1.36)	0.349
Unprotected well	103 (16.78)	2.13 (1.32 - 3.43)	0.016	2.91 (1.69 - 5.02)	<0.001
Locally protected well	74 (12.05)	0.47 (0.026 - 0.87)	0.016	0.46 (0.24 - 0.89)	0.022

The marital status of the household head also remained associated with women's minimum dietary diversity among polygamous households (p = 0.007), whereas separated (p = 0.552) and widowed (p = 0.562) statuses showed no significant association after adjustment. Women living in polygamous households were twice as likely to achieve minimum dietary diversity compared to those in monogamous households (aOR = 2.09; 95% CI: 1.23 - 3.56; p = 0.007).

Women's age remained significantly associated with minimum dietary diversity after adjustment. Women aged 30 - 44 years, 45 - 59 years, and 60 years or older had respectively 2 times (aOR = 1.70; 95% CI: 1.06 - 2.73; p = 0.027), 3 times (aOR = 3.32; 95% CI: 1.62 - 6.78; p = 0.001), and 12 times (aOR = 11.52; 95% CI: 3.31 - 40.11; p < 0.001) higher odds of achieving minimum dietary diversity compared to women under 29 years of age.

Women's physiological status remained strongly associated with minimum dietary diversity after adjustment. Pregnant and lactating women were three times more likely to achieve minimum dietary diversity than non-pregnant, non-lactating women (aOR = 3.41; 95% CI: 2.19 - 5.31; p < 0.001).

Household hunger index also remained significantly associated with women's minimum dietary diversity (p < 0.001). Women living in households experiencing hunger had significantly lower odds of achieving minimum dietary diversity compared to those in households with little or no hunger (aOR = 0.23; 95% CI: 0.15 - 0.34; p < 0.001).

The type of drinking water source was also associated with women's minimum dietary diversity after adjustment. However, the use of a pumped borehole showed no significant association after adjustment (p = 0.349). Multivariate logistic regression analysis of factors associated with children's minimum dietary diversity.

Table 3 presents the factors associated with minimum dietary diversity among children under five years of age after multivariate logistic regression. The educational level and marital status of the household head remained significantly associated with children's minimum dietary diversity (p < 0.001). Children living in households headed by separated individuals were significantly less likely to achieve minimum dietary diversity compared to those in monogamous households (aOR = 0.02; 95% CI: 0.002 - 0.23; p = 0.001).

Table 3. Factors associated with minimum dietary diversity among children under five: Multivariate logistic regression.

Variables	n (%)	Crude OR (95% CI)	p-Value	Adjusted OR (95% CI)	p-Value
Educational level of household head					
Primary	307 (50.00)	1.54 (0.72 - 3.29)	0.269	0.04 (0.01 - 0.215)	<0.001
Secondary	172 (28.01)	2.41 (1.10 - 5.28)	0.028	0.12 (0.02 - 0.61)	0.010
Higher	31 (5.05)	9.89 (3.71 - 26.41)	<0.001	0.10 (0.01 - 0.79)	0.028
Marital status of household head					
Polygamous	111 (18.08)	1.67 (1.01 - 2.81)	0.045	0.82 (0.35 - 1.94)	0.66
Separated	39 (6.35)	0.46 (0.14 - 1.54)	0.207	0.02 (0.002 - 0.23)	0.001
Widowed	34 (5.54)	1		1	
Woman's age (years)					
30 - 44	249 (40.55)	2.38 (1.44 - 3.95)	0.001	3.28 (1.21 - 8.93)	0.020
45 - 59	91 (14.82)	1.88 (0.96 - 3.69)	0.067	2.11 (0.55 - 8.13)	0.28
≥60	19 (3.09)	1		1	
Woman's physiological status					
Vulnerable (pregnant or lactating)	299 (48.70)	1.63 (1.05 - 2.54)	0.031	7.41 (3.21 - 17.11)	<0.001
Child's age (months)					
12 - 23 months	100 (16.29)	0.37 (0.11 - 1.27)	0.115	0.32 (0.06 - 1.61)	0.165
24 - 59 months	341 (55.54)	1.91 (0.78 - 4.66)	0.157	5.57 (1.64 - 18.92)	0.006
Estimated monthly food expenditure (FC)					
20,000 - 50,000 FC	275 (44.79)	0.74 (0.39 - 1.42)	0.375	1.01 (0.42 - 2.43)	0.984
>50,000 FC	222 (36.16)	1.83 (0.99 - 3.39)	0.053	4.38 (1.08 - 17.68)	0.038
Household hunger index (IDFM)					
Hunger	274 (44.63)	0.17 (0.10 - 0.31)	<0.001	0.25 (0.12 - 0.53)	<0.001
Type of drinking water source					
Pumped borehole	217 (35.34)	1.91 (1.14 - 2.16)	0.014	0.72 (0.23 - 2.23)	0.564
Unprotected well	103 (16.78)	0.58 (0.25 - 2.77)	0.191	0.57 (0.21 - 1.58)	0.281
Locally protected well	74 (12.05)	1.33 (0.64 - 2.77)	0.450	8.87 (2.92 - 26.92)	<0.001
Woman's nutritional status (MUAC)					
MAM	102 (16.94)	0.47 (0.23 - 0.97)	0.041	0.40 (0.15 - 1.11)	0.078
SAM	1	1			

Women's age remained significantly associated with children's minimum dietary diversity after adjustment. Children of women aged 30 - 44 years had three times higher odds of achieving minimum dietary diversity compared to children of women under 29 years (aOR = 3.28; 95% CI: 1.21 - 8.93; p = 0.020). However,

no significant association was observed for women aged 45 - 59 years after adjustment ($p = 0.280$).

Women's physiological status remained significantly associated with children's minimum dietary diversity after adjustment. Children of pregnant or lactating women were seven times more likely to achieve minimum dietary diversity compared to children of non-pregnant, non-lactating women (aOR = 7.41; 95% CI: 3.21 - 17.11; $p < 0.001$).

Child's age was also significantly associated with minimum dietary diversity after adjustment. Children aged 24 - 59 months had six times higher odds of achieving minimum dietary diversity compared to those aged 6 - 11 months (aOR = 5.57; 95% CI: 1.64 - 18.92; $p = 0.006$). No significant association was found for children aged 12 - 23 months after adjustment ($p = 0.165$).

The estimated monthly amount spent on food remained significantly associated with children's minimum dietary diversity. Children from households spending more than 50,000 Congolese francs per month on food were four times more likely to achieve minimum dietary diversity compared to those from households spending between 20,000 and 50,000 francs (aOR = 4.38; 95% CI: 1.08 - 17.68; $p = 0.038$).

Household hunger index remained significantly associated with children's minimum dietary diversity after adjustment. Children from households experiencing hunger had significantly lower odds of achieving minimum dietary diversity compared to those from households with little or no hunger (aOR = 0.25; 95% CI: 0.12 - 0.53; $p < 0.001$).

The type of drinking water source was also associated with children's minimum dietary diversity. Children from households using locally protected wells had nine times higher odds of achieving minimum dietary diversity compared to those using river water (aOR = 8.87; 95% CI: 2.92 - 26.92; $p < 0.001$). However, the use of a pumped borehole ($p = 0.564$) and women's nutritional status ($p = 0.078$) were not significantly associated with children's minimum dietary diversity after adjustment.

4. Discussion

This study aimed to analyze the factors associated with failure to achieve minimum dietary diversity among women and children under five years of age in the town of Yangambi, Democratic Republic of the Congo. The results revealed a high prevalence of inadequate minimum dietary diversity among both women (55.54%) and children under five years (84.53%) in Yangambi. After adjustment using multivariate binary logistic regression, several variables remained significantly associated with failure to achieve minimum dietary diversity among women and children. These included the educational level of the household head, the marital status of the household head, women's age, children's age, the household hunger index, and the amount spent on food.

The high proportion of women and children who did not achieve minimum dietary diversity observed in this study is consistent with findings from several

studies conducted in sub-Saharan Africa [5] [6] [12] [18]. In Ethiopia, Sitotaw *et al.* [5] also reported a high proportion of women failing to meet minimum dietary diversity, while Nikièma *et al.* [6] in Burkina Faso observed low dietary diversity among children.

In the DRC, previous surveys have already shown that more than 80% of children aged 6 - 23 months did not meet the minimum dietary diversity [15]. These findings may reflect the difficult socioeconomic conditions in Yangambi, characterized by a strong reliance on subsistence agriculture, limited dietary diversification, and restricted access to micronutrient-rich foods.

4.1. Educational Level of the Household Head

After multivariate analysis, the educational level of the household head remained significantly associated with minimum dietary diversity among both women and children. Among women, those living in households headed by individuals with higher education had a significantly greater likelihood of achieving minimum dietary diversity compared to those in households headed by individuals with little or no education (aOR = 21.88; 95% CI: 4.13 - 115.97; $p < 0.001$). Among children, the educational level of the household head was also significantly associated with minimum dietary diversity after adjustment.

Children living in households headed by individuals with primary (aOR = 0.04; 95% CI: 0.01 - 0.21; $p < 0.001$), secondary (aOR = 0.12; 95% CI: 0.02 - 0.61; $p = 0.010$), or higher education (aOR = 0.10; 95% CI: 0.01 - 0.79; $p = 0.028$) had a significantly lower likelihood of failing to achieve minimum dietary diversity compared to those in households with no formal education. These findings are consistent with those reported by Sitotaw *et al.* [5], Nikièma *et al.* [6], and other studies conducted in similar African contexts [12] [13] [17] [18], which found that the risk of inadequate dietary diversity was higher in households headed by uneducated individuals.

This association may be explained by the fact that a higher level of education improves nutritional knowledge, household resource management, and access to economic opportunities that facilitate the acquisition of diverse foods. Higher education also enables a better understanding of appropriate dietary and nutritional practices for women and children.

4.2. Marital Status of the Household Head

Multivariate analysis showed that the marital status of the household head remained significantly associated with children's minimum dietary diversity, but not with that of women. Among women, those living in households headed by separated individuals had a lower likelihood of achieving minimum dietary diversity compared to those in monogamous households; however, this association was not statistically significant (aOR = 0.77; 95% CI: 0.23 - 1.83; $p = 0.757$).

Among children, those living in households headed by separated individuals had a significantly lower likelihood of achieving minimum dietary diversity (aOR

= 0.02; 95% CI: 0.002 - 0.23; p = 0.001). A similar trend has been reported in some African studies [12] [18]. This situation may reflect the socioeconomic challenges associated with marital separation, which can reduce available resources for children's food and nutrition.

4.3. Woman's Age

The results of the multivariate logistic regression showed that women's age remained significantly associated with minimum dietary diversity among both women and children in certain age groups. Among women, those aged 30 - 44 years had a higher likelihood of achieving minimum dietary diversity compared to those under 30 years (aOR = 1.70; 95% CI: 1.06 - 2.73; p = 0.027). This likelihood was even higher among women aged 45 - 59 years (aOR = 3.32; 95% CI: 1.62 - 6.78; p = 0.001) and among those aged 60 years or older (aOR = 11.52; 95% CI: 3.31 - 40.11; p < 0.001). Among children, those living in households headed by women aged 30 - 44 years also had a significantly higher likelihood of achieving minimum dietary diversity compared to those living with women under 30 years (aOR = 3.28; 95% CI: 1.21 - 8.93; p = 0.020).

However, this association was not statistically significant among women aged 45 - 59 years (aOR = 2.11; 95% CI: 0.55 - 8.13; p = 0.280). These findings are consistent with results reported in several African studies [5] [6] [18]. This may be explained by the fact that older women generally have greater experience in household food management, better socioeconomic stability, and a stronger understanding of nutritional practices that support dietary diversity.

4.4. Child's Age

In the multivariate model, the child's age remained significantly associated with minimum dietary diversity. Children aged 24 - 59 months had a significantly higher likelihood of achieving minimum dietary diversity compared to those aged 6 - 11 months (aOR = 5.57; 95% CI: 1.64 - 18.92; p = 0.006). In contrast, this association was not statistically significant among children aged 12 - 23 months (aOR = 0.32; 95% CI: 0.06 - 1.61; p = 0.165). Similar findings have been reported in several studies conducted in comparable nutritional contexts [6] [12] [18]. This may be attributed to the gradual introduction of a more diversified diet among children aged 24 - 59 months. Unlike most studies that focus exclusively on children aged 6 - 23 months, our study also explored dietary diversity among children aged 24 - 59 months because of the persistent burden of malnutrition observed among preschool-aged children in rural areas of the Democratic Republic of the Congo. This approach provided additional information on dietary patterns in older children, although the dietary diversity indicator has been more commonly applied to younger age groups.

4.5. Woman's Physiological Status

After adjustment using multivariate logistic regression, women's physiological

status remained significantly associated with minimum dietary diversity among both women and children. Pregnant or lactating women had a significantly higher likelihood of achieving minimum dietary diversity compared to other women (aOR = 3.41; 95% CI: 2.19 - 5.31; $p < 0.001$). Similarly, children living in households with pregnant or lactating women also had a higher likelihood of achieving minimum dietary diversity (aOR = 7.41; 95% CI: 3.21 - 17.11; $p < 0.001$). These findings are consistent with results reported in several African studies [4]-[6] [18]. This observation may be linked to the special nutritional attention given to pregnant and lactating women and their children, as well as nutrition education programs targeting these vulnerable groups.

4.6. Household Hunger Index

The household hunger index remained significantly associated with minimum dietary diversity among both women and children after adjustment. Women living in food-insecure households had a significantly lower likelihood of achieving minimum dietary diversity compared to those in food-secure households (aOR = 0.23; 95% CI: 0.15 - 0.34; $p < 0.001$). Similarly, children from households experiencing hunger also had reduced odds of achieving minimum dietary diversity (aOR = 0.25; 95% CI: 0.12 - 0.53; $p < 0.001$). These results are consistent with findings from several studies conducted in Africa [6] [7] [10] [12]. This may reflect the limited access of food-insecure households to sufficient and diverse foods, thereby reducing dietary quality for women and children.

4.7. Monthly Amount Spent on Food

According to the multivariate logistic regression, the estimated monthly amount spent on food remained significantly associated with children's minimum dietary diversity. Children living in households spending more than 50,000 FC per month on food had a significantly higher likelihood of achieving minimum dietary diversity compared to those in households spending less than 20,000 FC (aOR = 4.38; 95% CI: 1.08 - 17.68; $p = 0.038$). However, this association was not statistically significant in households spending between 20,000 and 50,000 FC on food (aOR = 1.01; 95% CI: 0.42 - 2.43; $p = 0.984$). A similar trend has been observed in several African studies [6] [11] [16] [17]. This may be explained by the fact that a higher food budget improves access to a wider variety of nutrient-rich food groups.

4.8. Strengths and Limitations of the Study

This study provides recent data on the factors associated with failure to achieve minimum dietary diversity among women and children in a rural setting that is poorly documented in the Democratic Republic of the Congo. The use of internationally recognized nutritional indicators and multivariate analysis made it possible to identify the main factors associated with minimum dietary diversity in Yangambi.

However, the cross-sectional nature of this study does not allow for the estab-

lishment of causal relationships between the factors studied and minimum dietary diversity. Some of the information collected was based on participants' self-reports and may be subject to recall bias.

In addition, certain categories were poorly represented, which may explain the high odds ratios observed for some variables. Despite these limitations, this study provides valuable information that can help guide nutritional interventions and public health policies aimed at improving dietary diversity among women and children in Yangambi and in other similar contexts in the Democratic Republic of the Congo. An additional limitation of this study is that dietary diversity among children aged 24 - 59 months was assessed using an adapted dietary diversity approach. Although this enabled the exploration of dietary diversity among all preschool-aged children, this indicator was originally developed for younger children and should therefore be interpreted with caution. Furthermore, some adjusted odds ratios were relatively large and associated with wide confidence intervals, which may reflect the small number of observations in certain categories.

5. Conclusions

This study revealed a high prevalence of failure to achieve minimum dietary diversity among women and children under five years of age in Yangambi. The main factors associated with this situation were the educational level of the household head, the marital status of the household head, women's age, children's age, women's physiological status, the household hunger index, and the amount spent on food.

These findings highlight the need to strengthen nutritional interventions and food security programs targeting vulnerable households, through improvements in socioeconomic conditions, nutritional education, and access to diverse diets in rural areas of the Democratic Republic of the Congo.

Conflicts of Interest

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

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