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Gender differences in perceptions and preferences for the safety of Fulani milk and its products in Ogun state, Nigeria

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Abstract - This study examines from a gender perspective the factors that influence the perception and consumption of milk and other dairy products produced by Fulani pastoralists, especially women. Data was sourced from 120 men and women consumers of Fulani milk in Ogun State, Nigeria, using a multistage sampling technique. The Wilcoxon Rank Sum test was used to undertake the test of differences, including gender and preference. Probit regression analysis was used to examine the factors influencing the preference for Fulani milk and its products among the male and female respondents. Findings from the study show that age, education, income, and expenditure on milk were the main determinants of the preference for milk and products among women. The study concludes that men's and women's perceptions are influenced by the safety, hygiene, and nutrition status of the Fulani milk, and these influence their preference and use of the milk and milk products. Government and other stakeholders should make concerted efforts to provide incentives and facilities that can promote good management practices among the Fulani women pastoralists. Adopting these good management practices will improve the purchase and consumption of milk and milk products among the local populace. This is important in the process of alleviating poverty and improving the economic empowerment of the Fulani women who play crucial roles in the preparation and sale of the milk and the products.
Keywords: Consumer preference, milk and milk products, gender, Fulani pastoralists, Nigeria

INTRODUCTION

Nigeria's food and nutrition security status, reflected by health and demographic indicators, is worrisome. Evidence from the body of literature in national and international reports and scholarly works points to a low level of undernourishment, high levels of food insecurity, and hunger (UNICEF, 2023; FAO *et al.*, 2024). This is despite the ambitious targets set by the government to combat the challenges. For instance, the Federal Government, in the 2016 National Policy on Food and Nutrition, set the target of 2025 to reduce by half the proportion of people suffering hunger and malnutrition, reduce stunting among under-five children from 37% to 25% and wasting to below 5% (Nigeria Ministry of National Budget and Planning, 2016; Federal Ministry of Health, 2021). With Nigeria ranking as one of the top 10 countries with the highest absolute number of undernourished people in 2023–2024, as well as an estimated 25 million people suffering from undernourishment (representing about 12–15% of the population) (FAO, *et al.*, 2024), the targets are increasingly becoming a mirage!

To perform better, Nigeria needs to improve on the equitable provision of access to nutritious foods, especially animal-sourced protein diets. This is because the staple in most African countries, especially in Nigeria, consists of cereals and root crops, which are available and affordable to many (Kumar and Kalita, 2017). On the other hand, milk, meat, egg, and other sources of animal protein in most instances are more expensive and may not be affordable by many people, especially those living below the poverty line in low- and middle-income countries (WHO, 2019). These foods are central to achieving food and nutrition security because they contain important nutrients that can enhance food and nutrition security, especially high-quality proteins, essential fatty acids, and micronutrients such as iron, zinc, calcium, and vitamin B12 (FAO *et al.*, 2024). Of these, milk is crucial, especially for maternal health, fetal development, and child growth due to the high calcium and balanced amino acid profile (UNICEF, 2023). Meeting the daily dietary protein requirements for men, women, and children, respectively, may be a challenging and difficult target for many of the poor populace in developing countries like Nigeria (Davis *et al.*, 2016). Therefore, equitable access to animal protein, especially milk and other dairy products, is important to fight malnourishment, thereby enhancing food and nutrition security.

In Nigeria, pastoralists, mainly Fulani cattle herders, play a central role in the livestock sector. According to the Federal Ministry of Agriculture and Rural Development, they supply about 90% of milk produced locally in the country (FMARD, 2021) and are important actors in enabling rural economies, livelihoods and support effective land use management in arid and semi-arid parts of the country. They play a significant role in the production of animals like goats, sheep, cattle, and camels, food products for human consumption such as meat and dairy products including milk and cheese, as well as animal products such as beef, hides, and skin (Fabusoro *et al.*, 2012). The pastoralists are responsible for local milk production and traditionally live in the northern part of the

country. Over the years, due to need for pasture and water resources, they migrate and settle in the southern part of the country and are important actors in the livestock sector in the region (Fabusoro and Oyegbami, 2009).

Gender specialisation exists along the local dairy value chain, with women pastoralists playing significant roles, especially in the processing and sale of milk and other dairy products. Men are primarily responsible for milking the cows and distributing the raw milk to women in the farmstead, who then process it into various products such as cheese, *manshanu* or *fura denunu*, and fermented milk, known locally as *nunu* (Fabusoro and Oyegbami, 2009). Fulani milk and milk products have many benefits (Majekodunmi et al., 2014). First, serves as the main source of livelihood and income-generating activities for women pastoralists. Women's ability to earn and increase income is central to alleviating poverty and economic empowerment; hence, milk processing and sales are central to women pastoralists' food and livelihood security. Women are generally responsible for food selection and preparation and for the care and feeding of children (Keeley *et al.*, 2019). When women have control of income, substantial evidence indicates that there will be a positive spillover effect on the food and nutrition needs of the household through increased spending on food, children, and other household needs (Opata *et al.*, 2020). Second, Fulani milk and its products are cheaper and could be more affordable for the majority of the poor populace in countries like Nigeria, and this could boost their chances of meeting their daily dietary protein requirements (Fabusoro and Oyegbami, 2009).

While milk is a veritable source of protein, the process of production and processing can be contaminated if adequate safety methods are not taken into consideration. Consumer perception of poor hygiene and the safety of fresh milk products can hinder the promotion of milk consumption as an intervention to alleviate the burden of malnutrition (Kunadu *et al.*, 2018). This is important in the local dairy value chain through which the Fulanis make their milk. Across Africa, the Fulanis process milk using different traditional technologies. For instance, in Burkina Faso, the Fulani community uses calabashes, gourds, or clay pots seeded with a natural microbial inoculum for fermentation, while in Ghana, they use spontaneous fermentation of cow's milk without starter cultures. In Nigeria, *Nunu* is prepared from raw cow's milk in calabashes, gourds, clay pots, or rubber containers and is left to ferment for twenty-four hours. In Senegal, the local milk product is cow's milk, made by filtering and heating milk in an aluminium pot until it is almost boiling. Further processing, including sieving to remove fat, pasteurising, and packaging (Leone *et al,* 2022). These raise concerns of potential safety concerns, which can occur as contamination at any stage of the process.

Studies have proven that local production of milk is produced under unhygienic conditions that are prone to contamination (Omotayo *et al,* 2013; Olujimi *et al*., 2018). Contamination can arise during or after milking by microorganisms, processing, packaging, storage, and marketing. Lack of appropriate hygienic practices can lead to poor microbiological quality of milk and potentially failed fermentation. Leone *et al* (2022) identified three major categories of contamination during the process. These are microbiological, chemical, and physical. Microbiological contamination can occur when pathogens are transferred directly from the blood of an infected animal into milk or during the process of collection by the exterior of the udder. Since milk has a high nutrient content, contamination could expand rapidly because milk provides a conducive environment for the growth of microbes. These include pathogenic bacteria, yeasts, viruses, and/or parasites. Chemical hazards, ingestion of contaminated animal feedstuffs, and application of veterinary medicines could also cause some kind of contamination to milk and milk products. Evidence has traced foodborne illnesses globally to milk contamination (Tremonte *et al,* 2014). In Nigeria, for instance, Olujimi *et al* (2018) found a high concentration of heavy metals and phthalate esters in milk and cheese samples from settled pastoralists in Oyo and Ogun states, Nigeria. Also, Oluwafemi and Lawal (2015) established microbial contamination of raw milk and local soft cheese in the same states. It is therefore important to study the consumer perception of the safety of the locally produced milk and the products to ascertain whether this affects the consumer behaviour of the products.

While evidence abounds in the literature on the perception of the consumer's safety of the milk and products from Fulani Pastoralists, these, in most instances, have provided a limited view about gender differences that may exist. This study contributes to existing literature in two ways. First, it helps in understanding the dynamics of factors that affect the consumption/perception of the safety of milk and other dairy products produced by Fulani pastoralists, especially women. This is crucial to better open market opportunities, which could increase income, promote poverty reduction, and improve livelihoods for many women pastoralists whose main source of livelihood is from the processing and sale of milk and dairy products. Thus, it becomes very crucial to establish a priority list of the factors determining the perception or consumption of milk and other dairy products produced by the Fulani pastoralists. Second, establishing the factors that influence men's and

women's perceptions about milk and the products can help improve the milk's processing, thereby improving its preference and acceptability among the populace. High preference and acceptability of the milk and its products can go a long way in cushioning the challenges of meeting the daily dietary protein requirements of many poor Nigerians. This has many implications for women because they are responsible for food preparation and play significant roles in the dietary diversity of their households. Thus, improving their preference and acceptability of Fulani milk and milk products can help in improving dietary protein intake because the milk and the products are cheaper and more affordable than canned milk, which may not be within the reach of many poor people. In doing this, the study seeks to:

- Assess the gender differences in the perception of the safety of Fulani milk and its products among consumers; and
- Assess the factors influencing the preference for Fulani milk and products among male and female consumers.

Based on this, three hypotheses are tested as follows:

$H_0$1: There is no significant difference in the perception of the safety of Fulani milk and its products among consumers

Ho = $\mu_{preference} - \mu_{non\text{-}preference} = 0$ (the difference in the median is equal to zero)

Ha = $\mu_{preference} - \mu_{non\text{-}preference} \neq 0$ (the difference in the median is not equal to zero)

Where $\mu_{preference}$ and $\mu_{non\text{-}preference\ are}$ the population medians for consumers and non-consumers, respectively

$H_0$2: There is no significant difference between male and female consumers in their perception of the safety of Fulani milk and the products

Ho = $\mu_{female} - \mu_{male} = 0$ (the difference in the median is equal to zero)

Ha = $\mu_{female} - \mu_{male} \neq 0$ (the difference in the median is not equal to zero)

Where μ_{female} and μ_{male} are the population medians for female and male respondents, respectively

$H_0$3: The socio-demographic characteristics influence the preference for Fulani milk and products among male and female consumers

METHODOLOGY

The data for this study were sourced from consumers of Fulani milk and its products in Ogun State, Nigeria. Using a multistage sampling technique, 120 respondents were selected. First, 10% of the 20 local government areas (LGAs) from Ogun State were selected using the Probability Proportional to Sample Size (PPS) technique. Two LGAs, Odeda and Abeokuta North, were therefore purposively selected. The selection was due to the high concentration of Fulani communities (Alarima and Obikwelu, 2018; David, 2016). Second, some 60 respondents were randomly selected in each LGA, giving a total of 120 respondents. A structured questionnaire was used to collect primary data on consumption, preference, and perception of the safety of Fulani milk and its products.

Measures and estimation procedure

To achieve the objectives of the study, the Wilcoxon Rank Sum test is used to test whether there are gender differences in the perception of the safety of Fulani Milk and its products. Furthermore, it is used to test the differences in perception among those who have a preference for it and those who do not. The Wilcoxon Rank Sum test is used because perception is measured using a 5-point Likert scale and does not satisfy the conditions of a parametric test, such as normal distribution of the two independent populations. The null hypothesis of the Wilcoxon Rank Sum test is usually taken as equal medians (Oyeka and Ebuh, 2012). The use of either parametric or non-parametric tests for analysing Likert scale is a subject of debate in the literature (Jamieson, 2004; Allen and Seaman, 2007; Sullivan and Artino, 2013). However, the general understanding is that when the condition of normal distribution is violated, the non-parametric test is to be used. This justifies the use of the Wilcoxon Rank Sum test in this study.

The probit regression model is used to estimate the factors influencing the preference for Fulani milk and its products among the male and female respondents. It is ideal for testing hypotheses between a binary outcome variable and one or more categorical or continuous predictor variables. This therefore suits this study because the dependent variable, preference for milk and products, is a dummy variable coded as 1 in case one has a preference or 0, if otherwise. The independent variables include respondents' socio-economic characteristics such as age, marital status, education, religion, occupation, household size, income, expenditure on milk, and residency status. Marital status, religion and occupation are nominal variables. They are constructed as categorical variables while education is an ordinal variable also, constructed as categorical. On the other hand, age, residency status, household size, expenditure on milk and income are continuous variables.

RESULTS DISCUSSION

Gender analysis

The gender analysis of the socio-economic characteristics of the respondents is presented in Table 1. The results show gender differences in the age, occupation, monthly income, and expenditure on the purchase of Fulani milk and its products. For instance, the study shows that about 60 percent of

the women are in the young age group of less than 30 years, while the majority of the men (52.46%) fall within the mid-age group of between 30 and 50 years. On average, the age of male respondents was 33 years, while that of females was 30 years. This implies that male respondents are relatively older than their female counterparts. In terms of occupation, trading appears to be the common occupation among most women respondents (43.86%), while for men, a substantial proportion of them (33%) are artisans. The study was conducted in Ogun State in the Southwest region of Nigeria, a state that is dominated by the Yoruba people. The Yoruba women in Southwest Nigeria have been recognised to participate actively in income-generating activities, and trading is widely acknowledged as the leading pursuit among them.

Table 1: Gender analysis of socio-economic characteristics of respondents (%)

	Male	Female
Age (years) (n = 61; 59)		
Young (<30)	40.98	59.32
Mid-age (30-50)	52.46	32.20
Old (>50)	6.56	8.47
Mean age	33.49	30.69
Marital status (n = 61; 59)		
Single	31.15	37.29
Married	67.21	49.15
Widowed	1.64	11.86
Divorced		1.69
Education (n = 56; 56)		
None	21.43	12.50
Primary	14.29	16.07
Secondary	32.14	39.29
Tertiary	32.14	32.14
Religion (n = 59; 57)		
Islam	61.02	49.12
Christianity	38.98	50.88
Occupation (n = 60; 57)		
Trading	15.00	43.86
Civil service	11.67	10.53
Farming	23.33	8.77
Student	16.67	19.30
Artisan	33.33	17.54
Household size (n = 58; 57)		
Small (<5)	27.59	59.65
Medium (5-10)	68.97	38.60
Large (>10)	3.45	1.75
Mean household size	5.91	5.15
Monthly Income (Naira) (n = 48; 43)		
< Minimum wage (< 18000)	35.42	55.81
>= Minimum wage (18000 and above)	64.58	44.19
Mean income	25,541.67	19,837.21
Average expenditure on milk (Monthly in Naira) (n = 52; 51)		
Low (<=500)	48.08	58.82
Medium (501 – 1000)	26.92	21.57
High (>1000)	25.00	19.61
Mean expenditure	914.42	726.47
Residency (years) (n = 58; 59)		
<5	37.93	42.37
5-20	41.38	45.76
>20	20.69	11.86
Mean residency	12.10	9.57
Preference for Fulani milk (n = 60; 58)	66.67	58.62

Concerning the average monthly income, the results also show gender differences among the respondents. While most respondents were low-income earners, men (average 25,500 Naira) earn more income than women (average 19,800 Naira). Using the country's minimum wage at the time of the survey as a threshold, the study shows that about two-thirds of the men (64.58%) earn above the minimum wage of more than 18,000 Naira (43 US dollars). On the contrary, more than half of the women (55.81%) indicated that they earn less than the minimum monthly income. With regards to the average monthly expenditure on purchasing milk and milk products, the results show that, on average, men spent more (about 914 Naira) on milk than women (726 Naira). The breakdown further shows that more women (58.82%) than men (48.08%) spent a low amount of money (less than 500 Naira per month), while a larger proportion of men spent more than 1,000 Naira monthly on average on milk and milk products. A possible explanation is that since men earn more income than women, they may have higher disposable income than women, which allows them to buy milk and other products. Similarly, on average, men have longer residency status than women in the study area. Men had stayed for about 12 years compared to 9 years for women.

In terms of educational status, the results from this study also indicate a disparity in the educational status of men and women in the study area. While an equal proportion of respondents had tertiary education, more women than men completed primary and secondary education. The disparity is wider among respondents without formal education, with more men (21.43%) than women (12.5%) indicating that they did not have any form of formal education. On the preference for Fulani milk, our study reveals a gender difference, with the male group having a greater preference than the female group.

Preference and perception of safety of milk and its products from Fulani pastoralists

This section presents the results of the test of the first hypothesis: a statistical difference in the preference and perception of the safety of Fulani milk and milk products (Table 2). The results were interpreted from two angles: testing the hypothesis using the outcome of the Ranksum Wilcoxon test and analysing the implications using the median value. The group with the larger median value drives the change whenever there is a statistically significant difference.

Table 2: Preference for the safety of milk and products from Fulani

		Preference (n = 74)	Non-preference (n = 44)	Z
a.	I am not concerned of the safety of the milk	3.0	2.0	0.343
b.	I like the milk from Fulani to other packaged milk	4.0	2.0	4.839***
c.	The milk from Fulani does not have any contamination	3.0	3.0	1.620
d.	The milk from Fulani is safe for consumption	4.0	4.0	2.798***
e.	The hygiene status of the Fulani themselves does not affect their milk	2.5	3.0	-2.344***
f.	The milk contains essential nutrients for good body development	5.0	4.0	2.626***
g.	I am satisfied with taking the milk	4.0	4.0	1.031
h.	I can refer it to another person, as it is safe	4.0	3.0	4.879***
i.	The impurities in milk and other products from Fulani pastoralists can still be tolerated	4.0	3.0	1.288
j.	Further processing would help to remove impurities	2.0	2.0	0.969
k.	The milk is already safe, so it does not need regulation from NAFDAC	4.0	4.5	-3.298***
l.	Further processing would help to improve the safety of the Fulani milk	4.0	4.5	-0.931
m.	The product from Fulani milk is good for consumption	4.0	4.0	0.999
n.	I am sure the Fulani milk and its products would pass all regulatory and scientific processes	3.0	3.0	0.478

The null hypothesis assumes no significant difference in consumers' preference for Fulani milk and products. While this holds in some instances (a, c, g, i, j, l, m, and n), the alternative hypothesis holds in others (b, d, e, f, h, k) (see Table 2). These are explained below:

H_b: There is a significant difference in the preference for Fulani milk and its products relative to other packaged milk ($z=4.839$; $p<0.01$).

The Table reveals a significant difference in the perception of Fulani milk in comparison with other packaged milk ($p < 0.01$). The interpretation is that those with a preference for Fulani milk have a

higher consideration for it over packaged milk than those who do not prefer the milk. In addition, the Table shows a variation in the median figure with the preference group having a bigger value. This implies that the respondents with a preference for Fulani milk are responsible for the significant difference in the perception.

H_d: There is a significant difference on the preference for Fulani milk and its products based on their safety for consumption ($z=2.798$; $p<0.01$).

The analysis reveals a significant difference between the two groups on the safety of consumption of Fulani milk ($p < 0.01$). Although there is no variation in the median values for the two groups, the variation in the 25th percentile reveals that the preference group has a higher figure. Those who prefer Fulani milk consider the milk safe for consumption in comparison to those who do not prefer the milk. We can imply that respondents who prefer Fulani milk are the drivers of the differences in opinion that the milk is safe for consumption.

H_e: The belief that the hygiene status of the Fulanis does not affect their milk is statistically different between those who prefer the milk and those who do not ($z=-2.344$; $p<0.01$)

The higher median figure for non-preference in the Table shows that respondents who do not prefer the Fulani milk are responsible for the difference in the perception. Taken together with the negative coefficient, it can be inferred that the hygiene status of the Fulanis does affect their milk. This implies that people who do not prefer the Fulani milk believe that the hygiene status of the Fulanis influences their milk production.

H_f: The perception that the Fulani milk contains essential nutrients for good body development is statistically significant between those who prefer it and those who do not ($z=-2.626$; $p<0.01$)

The alternative hypothesis, that Fulani milk contains essential nutrients for good body development, holds. This shows that people who prefer Fulani milk consider the milk highly nutritious for good body development in comparison to those who do not prefer the milk. The higher median figure for the preference group indicates that the group is the driver of the perception that milk contains essential nutrients that are good for the body.

H_h: The perception that Fulani milk and its products are safe and can be referred to by another person is significantly different between the preference and non-preference groups ($z=-4.879$; $p<0.01$)

From the higher median figure in Table 2, we can infer that respondents who prefer Fulani milk are the drivers of the differences in opinion that the milk is safe and can be referred to other consumers. This implies that people who prefer the Fulani milk consider it safe for consumption when compared to those who do not.

H_k: There is a statistical difference in the perception that Fulani milk and products are safe and do not need NAFDAC regulation between those who prefer it and those who do not ($z=--3.298$; $p<0.01$).

The higher median figure for non-preference shows that respondents who do not prefer Fulani milk are responsible for the difference in the perception. Taken together with the negative coefficient, it can therefore be inferred that the Fulani milk is not safe and therefore needs NAFDAC regulation. This implies that people who do not prefer Fulani milk believe that the milk and the products are not safe and will therefore need NAFDAC regulations.

Gender variations in the perception of Fulani milk and products

The second hypothesis is tested in this section. This seeks to assess the gender differences in the perception of milk and milk products among the Fulani. The results are presented in Table 3. The result shows that there is a significant gender difference in the perception of the safety of Fulani milk around three issues: k) the product is safe, doesn't need NAFDAC regulation; l) further processing would improve the safety; and m) the product is good for consumption. Therefore, we reject the null hypothesis in these cases. Specifically, this holds for the following hypotheses:

H_k: There is a significant gender difference in the perception that the milk is already safe, so it does not need regulation from NAFDAC ($z = 2.083$; $p<0.05$).

The higher median figure shows that women account for the difference in perception. Hence, it can be implied that more women than men feel that the milk is safe and doesn't need regulation from NAFDAC.

H_l: There is a significant gender difference in the perception that further processing will help to improve the safety of the milk ($z = 1.923$; $p<0.05$).

When the analysis is based on the median values, it seems that there is no variation; however, at the 25th percentile, the figures indeed reveal the variation in perception among male and female respondents, with the female respondents having higher values. It can thus be implied that more women than men hold the belief that to improve the safety of the milk, there is a need for further processing.

H_m: There is a significant gender difference in the perception that the milk products from the Fulanis are safe for consumption ($z = -2.779$; $p<0.01$).

The differences in the perception of the safety of Fulani milk for consumption can be attributable to male respondents. Despite the seeming lack of variation in the median value, the variation can be seen from the higher figures for the male respondents at the 25th percentile. Taking together with the negative coefficient, this indicates that more men than women believe that the milk

products from the Fulani are unsafe for consumption.

Taken together, the inference is that while more women than men believe that the Fulani milk is safe for consumption, more women hold the belief that further processing is needed to improve the safety.

Table 3: Gender variations in perception of milk from Fulani

		Male (n = 61)	Female (n = 59)	Z
a.	I am not concerned about the safety of the milk	3.0	3.0	0.712
b.	I prefer the milk from Fulani to other packaged milk	4.0	4.0	- 0.891
c.	The milk from Fulani does not have any contamination	3.0	3.0	- 1.230
d.	The milk from Fulani is safe for consumption	4.0	4.0	-1.217
e.	The hygiene status of the Fulani themselves does not affect their milk	3.0	3.0	0.960
f.	The milk contains essential nutrients for good body development	5.0	4.0	-0.589
g.	I am satisfied with taking the milk	4.0	4.0	-1.040
h.	I can refer it to another person, as it is safe	4.0	4.0	-1.392
i.	The impurities in milk and other products from Fulani pastoralists can still be tolerated	4.0	3.0	-0.407
j.	Further processing would help to remove impurities	2.0	2.0	0.809
k.	The milk is already safe, so it does not need regulation from NAFDAC	3.0	4.0	2.083**
l.	Further processing would help to improve the safety of the Fulani milk	4.0	4.0	1.923**
m.	The product from Fulani milk is good for consumption	4.0	4.0	-2.779***
n.	I am sure the Fulani milk and its products would pass all regulatory and scientific processes	3.0	3.0	-1.102

Determinants of the preference for Fulani milk by sex

The results of the factors driving the preference for Fulani milk and milk products by male and female respondents are presented in Table 4. The result of the analysis of the male respondents is not reported because the model is not fit since the Prob > chi2 is greater than 0.05.

The female respondents' results show that age (β = 1.205; p<0.5); primary education (β = 0.004; p<0.1), income (β = 0.999; p<0.1), and expenditure on milk (β = 1.003; p<0.1) are the determinants of preference for Fulani milk and milk products. This shows that the older the women, the higher the odds of having a preference for Fulani milk.

Table 4: Determinants of preference for Fulani milk by female gender

	β	S.E.
Age	1.205**	0.115
Marital Status	0.615	0.788
Education		
• Primary	0.004*	0.012
• Secondary	0.214	0.410
• Tertiary	0.286	0.554
Religion	2.386	3.168
Occupation	2.275	1.507
Household size	0.789	0.364
Income	0.999*	0.000
Expenditure on milk	1.003*	0.001
Residency	0.751	0.144
_cons	0.247	1.160
Obs	34	
LR chi2(11)	20.05	
Prob > chi2	0.0447	
Pseudo R2	0.4296	
Log likelihood	-13.308514	

**p<0.05 *p<0.10

This implies that older women prefer Fulani milk products more than younger women by about 21%. Also, respondents with primary school education have lower odds of preference for Fulani milk and products than those without any formal education. The results of respondents in the higher education category are insignificant. In addition, the results show that high income and higher average expenditure on milk and its products have a minor odd of influencing the preference for Fulani milk and products.

RESULTS DISCUSSION

This study provides an assessment of gender differences in the perception of consumers with respect to the health safety of the milk and its products produced by the Fulani pastoralists. Results from the study show that there are gender differences in the economic status of the men and women respondents. Men in the study area seem to have higher economic status than women. Previous studies, especially in developing countries, have shown this trend in the economic status of men and women (Coker *et al.*, 2017). This is due to more opportunities available to men and their ability to use more of their time in productive activities where they can earn more income. In many instances, men allow their wives to work and earn income as long as the men control the income and its use (Farnworth *et al*, 2020). This gender gap in income was observed to influence women's purchasing power of milk, as the results show that, on average, men incur higher monthly expenditure on milk and milk products than women. As observed from the results, perceptions about safety, hygiene, and nutrition are factors that influence the consumers' preference for milk and milk products.

Findings from this study reveal that the older the women, the higher the preference for Fulani milk and products. Older women are likely to be either married, divorced, or widowed. This category includes about 50% who are married and another 13% who are either divorced or widowed; the number of women with children could potentially rise to 63%, about two-thirds of the sample. This possibly accounts for the high preference for Fulani milk and products. This is because married women play an important role in ensuring food security in their households, especially the nutritional needs of their children, allocating resources toward purchasing diverse and nutrient-rich foods, managing food processing, and meal preparation (Opata *et al.,* 2020; Egah *et al*., 2023; Ukonu, *et al.,* 2024). The study of Quisumbing *et al*. (1996) attests to the fact that women, especially those in developing countries, play crucial roles in maintaining the four pillars of food security: food availability, access, utilisation, and stability. There is therefore the tendency for this group of women to seek different means to meet the protein requirements of their wards, of which consuming Fulani milk and products is an option.

The study also found that primary education has a negative and high influence on the preference for Fulani milk and its products, compared to respondents with no formal education. It implies that respondents with primary education are far less likely to prefer Fulani milk than those with no formal education. The relationship between education and consumption or preference for milk or milk products is mixed. For instance, Idris-Adeniyi and Busari, (2019) found out that the consumption of locally made cheese is positively influenced by the respondent's level of formal education. That is, the more educated the respondents are, the higher their tendency to consume locally-made cheese. On the contrary, Alimi *et al* (2016) reported no significant difference between the level of education and preference for milk products. In this study, primary education, compared to lack of formal education, has a lower likelihood to influence the preference for Fulani milk and its products. However, higher education is insignificant with a preference for Fulani milk and products. This is because education has been established to contribute to people's knowledge and individual economic decision, therefore, influencing the choice of product to use (Kim *et al*., 2018). In addition, the educational level also improves people's income-earning capacity (Arsani *et al.,* 2020). This will have an attending positive effect on economic decision making and purchasing power ability of the individual. Therefore, the group of people with more education and higher purchasing power can prioritize better-packaged milk products rather than Fulani milk and product.

Preference for locally made milk products depended on the respondents' income. Findings from the study reveal that the lower the income, the higher the likelihood of willingness to buy locally made milk and milk products. There has been inconclusive evidence on the relationship between income and nutrition and food security. Some studies have shown a positive correlation between income and nutrition (Hoddinott and Haddad, 1995; Babatunde and Quaim, 2010) or children's nutritional status (Rodgers and Kassens, 2018; Abreha *et al.*, 2020). On the other hand, other studies, for instance, showed neutral and negative correlation between income and nutrition, respectively (Anderman *et al.,* 2014; van Asselt, J., and Useche, 2022). With higher disposable income, it was found that respondents will buy expensive substitutes like fish or beef. For instance, Idris-Adeniyi and Busari (2019) found that as the monthly income of the respondents increases, the frequency at which they consume local cheese decreases. This is because they tend to replace local cheese with

close substitutes like fish and meat, which have now become affordable to the respondents because of increased purchasing power. Hence, lower income usually hinders translation of intent into corresponding buying behaviour (Gassler *et al*., 2018). Also, this may be true generally, but the context may also bring some different dimensions (Conner and Oppenheim, 2008). In many cases, disposable income depends on the characteristics of the household, such as household size and the presence of dependent people, e.g., children. A child's presence in the household increased the likelihood of purchasing pasture-raised milk. Alimi *et al* (2016) found in the study of safety perception and willingness to pay for *fura* and *nunu* (Fulani milk products) that respondents with higher income were less likely to pay not only for milk products but also extra for the processing of the products to guarantee safety.

Lastly, expenditure on milk was found to have a marginal likelihood of influencing women's preference for Fulani milk. While the relationship is positive, the influence, as shown by the odds ratio of approximately 1, is marginal. This implies that expenditure on milk may influence expenditure on Fulani milk and products. This indicates that women who have the financial capacity to buy processed milk will also likely buy Fulani milk and its products.

CONCLUSION AND RECOMMENDATIONS

This study identified that Fulani milk and milk products serve as a good source of dietary protein in the study area. The men's and women's perceptions are influenced by the safety, hygiene, and nutrition status of the Fulani milk, and these influence their preference and use of the milk and milk products. Gender differences in the perception of milk and milk products, as observed from the study, are an indication of the areas for interventions that can enhance equitable production, sales, and consumption of the products among the male and female population. This includes issues like safety (men) and improved processing (women).

These call for efforts on the side of women pastoralists to apply the best methods for improving milk safety and hygiene status. Government, non-government organisations, and various stakeholders need to integrate literacy programmes and capacity building into smallholder dairying so as to ensure the use of best dairying practices among the Fulani pastoralists. Agencies of government like the National Orientation Agency can lead the sensitisation process in partnership with media groups, state governments, and the civil society organisations. The government and other stakeholders should make concerted efforts to provide incentives and facilities that can promote best practices in the processing of milk among the Fulani women pastoralists. Adopting these practices will improve the purchase and consumption of milk and milk products among the local populace. Coordinated efforts need to be made by various stakeholders, extension services, and government regulatory agencies like the National Agency for Food and Drug Administration and Control to formalise the processing of the Fulani milk and the products. This is important in the process of alleviating poverty and improving the economic empowerment of the Fulani women who play crucial roles in the preparation and sales of the milk. Addressing these issues will play a key role in the economic empowerment of the Fulani women pastoralists and help meet the daily dietary protein requirement in the study area.

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