

Research Article

Knowledge of Private Pharmacy Staff on the Dispensing of Breast Milk Substitutes in the Bamako District, 2023-2024

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Abstract

Introduction: Globally, 59% of infants under six months are not exclusively breastfed. Many receive alternative foods, including breast milk substitutes. This study aimed to assess the knowledge of private pharmacy staff regarding the dispensing of breast milk substitutes in the district of Bamako. **Methods:** A cross-sectional study was conducted from July 1, 2023, to November 30, 2024. Data were analyzed using SPSS version 25.0. The study population was composed of pharmacists, salespeople, and individuals responsible for dispensing breast milk substitute drugs in pharmacies. Pearson's chi-square or Fisher's exact tests were used, with a significance level of 5%. Confidentiality and anonymity of respondents were maintained. **Results:** The survey included 165 staff members, with men comprising 61.8% of participants. The mean age was 31.7 years (SD ±8.9). Most staff were assistants (53.3%), and 92.0% had less than 15 years of experience. Medical visits represented the primary source of training (84.7%). More than half of respondents (54.5%) lacked knowledge of the International Code of Marketing of Breast-milk Substitutes. Brand awareness was the main reason for dispensing specific product ranges (45.8%). Professional experience significantly influenced dispensing decisions. **Conclusion:** Pharmacy staff demonstrated limited knowledge of the International Code of Marketing of Breast-milk Substitutes. Continuous medical education is required to enhance the dispensing of breast milk substitutes in line with current recommendations.

Keywords

Breast-milk Substitutes, Pharmacy Staff, Knowledge, Dispensing, Mali

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1. Introduction

A breast milk substitute, also known as infant formula or infant milk, is defined by the WHO as any milk or product that can be used to replace breast milk, whether in liquid or powder form, which is specifically marketed for feeding infants and young children up to the age of three [1].

Globally, 59% of infants under six months are not exclusively breastfed and receive other foods, including breast milk substitutes [2]. From 2006 to 2015, infant formula sales in the United States increased by 158% [3]. In Phnom Penh, Cambodia, 43.1% of children aged 0 to 5 months and 29.3% of those aged 6 to 23 months consumed breast milk substitutes [4]. In Dakar, Senegal, 10.7% of infants under six months and 20.2% of those aged 6 to 23 months received breast milk substitutes [4]. In Mali, the NGO France Parrainages and its local partner reported that many children aged 0 to 1 could not be breastfed directly by their mothers, making formula milk the only alternative [5].

The knowledge of pharmacy staff is critical when dispensing breast milk substitutes, yet this expertise is shaped by multiple factors. Pharmacists receive limited training on this topic during their formal education, and milk laboratories often provide supplementary instruction to pharmacy teams [6]. Few training programs exist for pharmacy staff regarding infant nutrition, and only about one-third of pharmacy staff report feeling comfortable managing the milk section [6]. Responses to questions about milk products sold in pharmacies further reflect this lack of confidence [6]. Consequently, pharmacy professionals frequently experience uncertainty regarding product indications. Foundational knowledge of infant formula, supplemented by regular updates, is essential for providing accurate advice to parents [6]. Pharmacists should apply their expertise when dispensing formula, particularly by explaining the specific characteristics of available products to parents [7]. In Mali, the absence of prior studies highlights the need to assess the knowledge of private pharmacy staff regarding the dispensing of breast milk substitutes.

This study aimed to assess the knowledge of private pharmacy staff regarding the dispensing of breast milk substitutes in the district of Bamako.

2. Materials and Methods

2.1. Location and Study Setting

The study was conducted in private pharmacies in Bamako, the capital of Mali. Bamako is located on the banks of the Niger River, covers an area of 267 km², and is divided into six (6) municipalities: Municipality I, Municipality II, Municipality III, Municipality IV, Municipality V, and Municipality VI, with a population of 3,007,122 [8]. Each commune has a health referral center (HRC), and pharmacies are located around each HRC. The HRC is the first level of reference in

the healthcare pyramid [9]. The district of Bamako has 296 private pharmacies [10]. Bamako has a crude birth rate of 43.0 per 1,000 [11]. Some children cannot be breastfed directly by their mothers for various reasons, and given the activities of women, infant formula remains the only alternative for these infants [5].

2.2. Study Type and Population

It was a cross-sectional study which, conducted over seventeen (17) months from July 1, 2023, to November 30, 2024. The study population was composed of pharmacists, salespeople, and individuals responsible for dispensing breast milk substitute drugs in pharmacies.

2.3. Sampling

2.3.1. Sampling Techniques

A three-stage sampling method was employed. The first stage involved selecting all referral health centers in the Bamako district. This approach was chosen to capture the diverse knowledge of pharmacists, salespeople, and individuals responsible for dispensing breast milk substitute medications in pharmacies.

The second stage involved non-probabilistic sampling, with five pharmacies selected near each of the six HRC based on purposive criteria.

The third stage consisted of convenience sampling, selecting five individuals per pharmacy—one pharmacist, two salespeople, and two student interns—to complete the questionnaire.

2.3.2. Calculation of Sample Size

Six municipalities were included in the study. Five pharmacies were selected per municipality, resulting in a total of 30 pharmacies. The sample size (n) was calculated as $n = y * z$, where y represents the total number of pharmacies (30) and z the number of individuals per pharmacy (5), yielding $n = 30 * 5 = 150$. An additional 10% was added to account for incomplete or poorly completed survey forms, resulting in a final sample size of 165 participants.

2.4. Inclusion and Exclusion Criteria

The inclusion criteria for participating in this study were: agreement to participate in the survey, being a pharmacist, salesperson, or anyone responsible for dispensing breast milk substitute drugs. The exclusion criteria were: pharmacists, salespeople, or anyone responsible for dispensing breast milk substitute medicines which were absent, did not have time due to a lack of customers or emergencies, or were unavailable.

2.5. Operational Definitions

A pharmacist: a person who holds a state-issued degree from a faculty of pharmacy and who is responsible for preparing compounded medications and dispensing and delivering pharmaceutical products.

A salesperson: any technician responsible for assisting the pharmacy team with stock management.

An intern: a person training at a faculty of pharmacy or in other fields who assists the pharmacy team.

2.6. Data Collection Technique and Tools Used

Data were collected using a pre-established individual survey form distributed to each pharmacist, salesperson, and person responsible for dispensing breast milk substitute drugs, ensuring strict anonymity. Pharmacists were notified of the survey through an authorization request, which was signed and approved by the thesis supervisor and the National Council of the Order of Pharmacists (CNOP) prior to the survey. The research team visited the pharmacies, informed the pharmacists about the study, and explained the survey procedures. Survey forms were distributed to each selected participant after obtaining informed consent and providing a clear explanation of the study's objectives. Respondents completed the forms by checking the appropriate boxes, and assistance was provided to those who required support. Each participant was allotted approximately 10 minutes to complete the survey.

A validated question was administered to participants for data collection. They were collected face-to-face.

2.7. Data Processing and Analysis

The data were entered into Excel, processed, and analyzed using SPSS version 25.0. Ages were presented as the mean plus or minus the standard deviation, and in age groups. Qualitative variables were presented as numbers and percentages with a 95% confidence interval to indicate the degree of confidence in the percentages, calculated using the EpiTools application. A bivariate study was performed between the dependent variables and the independent variables to obtain associations in characters. Pearson's chi-square test or Fisher's exact test (independence test) were used to compare qualitative variables with a significance threshold of 5%.

2.8. Ethical Considerations

The protocol was submitted to, read by, and approved by the Dean of the Faculty of Pharmacy. Afterward, authorization was sought from the National Council of the Order of Pharmacists (CNOP) before the survey began. The survey forms were analyzed in strict compliance with confidentiality requirements. Verbal consent was obtained from the respondents and their anonymity was preserved; only the form numbers were used to identify the data. These data were used solely to assess the knowledge of private pharmacy staff on the dispensing of breast milk substitutes.

3. Results

3.1. Study Population Structure

The sex ratio was 1.6. The mean age of participants was 31.7 ± 8.9 years, and the average length of service was 6.6 ± 7.1 years. Assistants represented 53.3%, the trainee 23,6% and pharmacists 23.03% (Table 1).

Table 1. Sociodemographic characteristics of pharmacy staff involved in over-the-counter medicine dispensing in Bamako District pharmacies, 2024.

	n	%	IC95%
Sex			
Male	102	61.8	54.2-68.9
Female	63	38.2	31.1-45.8
Age category (years)			
≤30	81	55.1	47-62.9
30-50	59	40.1	32.6-48.2
>50	7	4.8	2.3-9.5
Occupation			
Assistants	88	53.3	45.7-60.8

	n	%	IC95%
Trainee	39	23.6	17.8-30.7
Pharmacist*	38	23.03	17.3-30
Number of years of experience			
≤15	138	92.0	86.5-95.4
15-30	8	5.3	2.7-10.2
>30	4	2.7	1-6.7

*: Registered pharmacist 2 and assistant pharmacist 36

3.2. Assessment of Pharmacy Staff Knowledge on Over-the-counter Medicine Dispensing in Private Pharmacies in the Bamako District

Table 2. Knowledge of pharmacy staff in the Bamako district on dispensing over-the-counter medicines in private pharmacies, 2024.

	n	%	IC95%
Training received on infant formula?			
YES	85	51.5	43.9-59
Training Method			
Medical visit	72	84.7	75.6-90.8
Post-graduate Education and training	13	15.29	9.2-24.4
Categories of infant formula			
Two categories	11	8.7	4.9-15
Three categories	96	76.2	68-82.8
Four categories	10	7.9	4.4-14
Several	9	7.1	3.8-13
Criteria for choosing infant formula			
Age	62	43.9	36-52.2
Physiological status (PS)	5	3.5	1.5-8
Scientific criteria (SC)	3	2.1	0.7-6.1
Age + PS*	38	27.0	20.3-34.8
PS + SC*	3	2.1	0.7-6.1
Age + SC	9	6.4	3.4-11.7
Age + PS + SC	21	14.9	10-21.7
Knowledge of the International Code of Marketing of Breast-milk Substitutes			
No	90	54.5	46.9-62
Regulations			
WHO			
No	21	28.0	19.1-39
UNICEF			

	n	%	IC95%
No	44	58.7	47.4-69.1
European directives			
No	69	92.0	83.6-96.3
Association of Pediatricians of Mali			
No	53	70.7	59.6-79.8
Health and nutrition promotion			
No	42	56.0	44.7-66.7

*PS: Physiological status, *SC: Scientific criteria

3.3. The Different Breast Milk Substitute Dispensed in Private Pharmacies in the Bamako District

Table 3. Availability and reason for dispensing BMS ranges in pharmacies in the Bamako District in 2024.

Range of infant milk	n	%	IC95%
Availability	165	100	53-67.7
Rationale for Dispensing Different Product Ranges			
Consumer Brand Awareness	59	45.8	37.4-54.3
Market Availability	14	10.9	6.6-17.4
Socioeconomic Status of Customers	39	30.23	23-38.6
Medical prescription	17	13.17	8.4-20.1

3.4. Determinants of Pharmacy Staff Knowledge Regarding the Dispensing of Breast Milk Substitutes in Private Pharmacies in the Bamako District

Table 4. Factors associated with pharmacy staff-reported reasons for dispensing breast milk substitutes in the Bamako District, 2024.

Variables	Reasons for dispensing breast milk substitute ranges				p-value
	Brand awareness n (%)	Availability n (%)	Patient financial status n (%)	Medical prescription n (%)	
Profession					
Pharmacist	12 (36.4)	5 (15.2)	11 (33.3)	5 (15.2)	0.47
Trainee	11 (40.7)	1 (3.7)	10 (37.0)	5 (18.5)	
Assistant	36 (52.2)	8 (11.6)	18 (26.1)	7 (10.1)	
Years of experience					
≤15	51 (45.9)	9 (8.1)	35 (31.5)	16 (14.4)	0.01
15-30	2 (28.6)	3 (42.9)	2 (28.6)	0 (0.0)	
>30	1 (25.0)	2 (50.0)	0 (0.0)	1 (25.0)	
Training methods					

Variables	Reasons for dispensing breast milk substitute ranges				p-value
	Brand awareness n (%)	Availability n (%)	Patient financial status n (%)	Medical prescription n (%)	
Medical visit	30 (46.2)	7 (10.8)	21 (32.3)	7 (10.8)	0.87
Post-graduate education	4 (40.0)	2 (20.0)	3 (30.0)	1 (10.0)	

4. Discussion

4.1. Sociodemographic Characteristics of Staff in Private Pharmacies in the Bamako District

The majority of staff in this study were men. Neglo EYM in 2021 reported a similar proportion of 72.7% [12]. This finding may be attributed to the reluctance of some pharmacies to hire women, due to perceived social constraints such as the need for spousal permission and maternity-related absences, as well as lower educational attainment among women in Mali.

More than half of the staff in private pharmacies in the Bamako District were aged 30 years or younger. In 2020, Diarra C. found that the majority were aged 26 to 35 years [13]. This difference may reflect the overall youthfulness of the population. INSTAT Mali reported in 2023 that individuals aged 15 to 34 years represented 32% of the population [14].

Most respondents in this study were pharmacy assistants. In 2024, Barry FZ. reported a similar proportion of 49.6% [15]. In Mali, some pharmacists are unable to employ pharmacy graduates due to the remuneration scale established by the collective agreement for private pharmacies. Consequently, some pharmacies employ only one assistant or, in some cases, none.

Nearly all respondents had less than 15 years of professional experience, with an average of 6.6 ± 7.1 years. This result likely reflects the predominance of young staff, whose years of experience are influenced by the duration of their studies. In 2019, Demele G. found that 33.3% of staff had 11 years or more of seniority [16].

4.2. Knowledge of Private Pharmacy Staff on the Dispensing of Breast Milk Substitute Medicines in the Bamako District

More than half of the respondents reported having received training on breast milk substitute medicines. The primary mode of training was through medical visits. This may be because most training is provided by medical representatives

during their visits, and pharmacists and assistants do not receive formal instruction on dispensing breast milk substitute drugs during their academic studies. Follain C. in 2015 found a similar rate of 65% [6].

More than half of the respondents identified three categories of breast milk substitutes and indicated that age was the primary criterion for dispensing them. These findings suggest that breast milk substitutes correspond to the three key periods of infant feeding, which are determined by the maturation and development of the infant or child. The selection of breast milk substitutes is therefore age-specific. Additionally, more than half of the respondents lacked knowledge of the International Code of Marketing of Infant Formula. This may be attributed to the absence of this topic in academic training, limited awareness of these regulations in Mali, and insufficient communication.

4.3. The Different Breast Milk Substitutes Dispensed in Private Pharmacies in the Bamako District Vary in the Reasons for Their Dispensing

Less than half of respondents cited brand awareness as the reason for dispensing. Follain C. found a rate of 4% [6]. This difference may be explained by variations in sample size, with 165 participants in the present study compared to 75 in Follain C., as well as differences in the frequency of medical visits by laboratory representatives. Brand awareness remains significant in this context due to the marketing of multiple milk brands and the influence of medical representatives.

4.4. Determinants of Knowledge Among Staff at Private Pharmacies Regarding the Dispensing of Breast Milk Substitute Medicines in the Bamako District

The reason for dispensing breast milk substitute drugs was not associated with profession ($p=0.47$) or training method ($p=0.87$), but was significantly related to years of staff experience ($p=0.01$). This may be due to staff basing their decisions on brand reputation and the financial situation of patients. Younger staff are often more active and influenced by

recommendations from medical representatives. Consideration of patients' financial circumstances reflects the broader economic context, as not all patients can afford the full range of products.

5. Conclusions

This study found that staff knowledge was limited. Most respondents had received training on breast milk substitutes, primarily through medical visits, yet more than half lacked knowledge of the International Code of Marketing of Breast Milk Substitutes. Infant formula ranges were universally available, and brand awareness was the primary reason for dispensing these products.

Profession and means of training were not associated with the reason for dispensing, whereas years of experience showed a significant correlation.

Abbreviations

%	Percentage
BMS	Breast Milk Substitute
HRC	Health Referral Center
ELISA	Enzyme-linked Immunosorbent Assay
FF	Follow-on Formula
IF	Infant Formula
INSTAT	<i>Institut Nationale de la Statistique</i> (National Institut of Statistic)
WHO	World Health Organisation
TM	Toddler Milk
UNICEF	United Nations Children Emergency Fund

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Author Contributions

Oumar Sangho: Conceptualization, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing

Jean Paul Tchapebong: Conceptualization, Methodology, Supervision, Writing – original draft, Writing – review & editing

Djeneba Sanogo: Conceptualization, Data curation, Methodology, Writing – review & editing

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Belle Fortune Kuaguim Kenfack: Writing – review & editing

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Data Availability Statement

The data generated or analyzed during this study are not publicly available; however, they can be obtained from the corresponding authors upon reasonable request.

Conflicts of Interest

We declare that we have no competing interests.

References

- [1] OMS, UNICEF. Clarification on the classification of follow-up formulae for children aged 6 to 36 months as breast milk substitutes. <https://www.who.int/fr/publications-detail/WHO-NMH-NHD-18.11>
- [2] Desplats G. Ending the marketing of breast-milk substitutes: a major step forward in increasing breastfeeding rates. *Field Exchange* 67 French, <https://www.enonline.net/fex/67/fr/www.enonline.net/fex/67/fr/marketingdessubstitutsdulait> (2022, accessed 12 November 2023).
- [3] Neves, P. A., Barros, A. J., Baker, P., Piwoz, E., Santos, T. M., Gatica-Domínguez, G., Vaz, J. S., Rollins, N., & Victora, C. G. (2022). Consumption of breast milk, formula and other non-human milk by children aged under 2 years: analysis of eighty-six low- and middle-income countries. *Public health nutrition*, 25(3), 680-688. <https://doi.org/10.1017/S1368980020004061>
- [4] Zehner E. (2016). Promotion and consumption of breastmilk substitutes and infant foods in Cambodia, Nepal, Senegal and Tanzania. *Maternal & child nutrition*, 12 Suppl 2(Suppl 2), 3-7. <https://doi.org/10.1111/mcn.12308>
- [5] OMS. Au Mali, Formula milk remains the only alternative for a large number of infants. *France-parrainages*, <http://www.france-parrainages.org/international/au-mali-le-lait-maternise-reste-la-seule-alternative-pour-un-grand-nombre-de-e-nourrissons> (accessed 8 November 2023).

- [6] Cecile Follain. Infant formula: comparative analysis and the role of the pharmacist. Pharmaceutical sciences. Thesis, Rouen, 2015. <https://dumas.ccsd.cnrs.fr/dumas-01264820v1>
- [7] Clere N. How to choose a breast milk substitute? Pharmaceutical News 2015; 54: 43-46. <https://doi.org/10.1016/j.actpha.2015.07.009>
- [8] District de Bamako - District de Bamako, <https://bamako.ml/district-de-bamako/> (accessed 19 December 2023).
- [9] STRATEGIC PLAN FOR THE NATIONAL HEALTH AND SOCIAL INFORMATION SYSTEM 2020-2024 (PS-SNISS 2020-2024). 2021. https://files.aho.afro.who.int/afahobckpcontainer/production/files/PS-SNISS_2020-2024_VF_11fev2021.pdf
- [10] Sangho A, Sangho F, Kaloga A. Evaluation of the prescription and dispensing of medicines in Mali in 2021. PAMJ-One Health; 9. Epub ahead of print 23 December 2022. <https://doi.org/10.11604/pamj-oh.2022.9.26.38029>
- [11] Fane D, Coulibaly T. Daouda dit Aba FANE, Demographer, INSTAT, Report.
- [12] Neglo EYM. Assessment of knowledge and practices regarding the cold chain for temperature-sensitive medicines among pharmacy staff in Bamako Commune I from June to November 2021. Thesis, USTTB, 2022. <https://www.bibliosante.ml/handle/123456789/5641>
- [13] Diarra C. Knowledge, attitudes and practices of private pharmacy staff regarding narcotics regulations in Kayes. Thesis, USTTB, 2020. <https://www.bibliosante.ml/handle/123456789/4143>
- [14] INSTAT. GENERAL POPULATION AND HOUSING CENSUS (RGPH), Report. National Institute of Statistics of Mali, <https://www.instat-mali.org/fr/publications/recensement-general-de-la-population-et-de-lhabitat-rgph> (2024, accessed 19 July 2024).
- [15] Barry FZ. Study of the dispensing of artemisinin-based combination therapies in a pharmacy in Commune IV of the Bamako district: M'PEWO Pharmacy. Thesis, USTTB, 2024. <https://www.bibliosante.ml/handle/123456789/13393>
- [16] Dembele G. Study of human resource management (HRM) practices in private pharmaceutical establishments. Case study of 60 pharmacies in Bamako (Mali). Thesis, USTTB, 2019. <https://www.bibliosante.ml/handle/123456789/1010>