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An Assessment of Knowledge of Health Workers in Hospitals of Southern Province of Zambia, Towards Marketing of Breastmilk Substitutes Regulations

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Abstract

Background: Optimal breastfeeding practices have been undermined by unregulated marketing of breastmilk substitutes worldwide, resulting in about 820, 000 preventable deaths per year among children under five years globally. The International Code (thereafter called the Code) of Marketing Breastmilk Substitutes was developed by the World Health Organization, the United Nations Children's Emergency Fund and stakeholders to protect, promote and support breastfeeding. Member states are expected to domesticate the Code. Zambia enacted Statutory Instrument No. 48 of 2006, Regulations on marketing of breastmilk substitutes. Successful implementation calls for a good level of knowledge among health workers. However, we found no study, in Zambia on the marketing of breastmilk substitutes Regulations. Objective: To assess the level of knowledge of health workers on Zambia's Regulations on marketing breastmilk substitutes. Study design and methods: A mixed-method cross-sectional study. Data was collected online and in person. Probability proportional to size calculation yielded an estimated sample size of 384. A sample size of 410 after adjusting upwards assumed non-response rate, 401 participants responded. Quantitative data were analyzed using the Social Statistical Package for Social Sciences. Knowledge results were described by frequencies and percentages. Tests were conducted using univariable linear and multivariable regression analysis. A p-value of <0.05 was considered statistically significant. Thematic analysis was used for qualitative data analysis. Results: The mean overall level of good knowledge of health workers was 0.339 or 34% [SE: 0.0221; 95%CI: (0.2959, 0.3828)]. Conclusion: The level of knowledge among health workers in hospitals of Southern Province, Zambia was poor.

Keywords: *Breastmilk Substitute Regulations, Health Worker, Knowledge*

Introduction

Breastfeeding is the gold standard for optimal infant nutrition and child survival [1]. Growing evidence indicates that optimal breastfeeding practices have been undermined by the aggressive, inappropriate, unethical, and unregulated marketing (product promotion distribution, trading or information giving) of breastmilk substitutes (BMS) worldwide [1, 2]. This results in, about 820, 000 preventable deaths per year, among children under the age of five years globally [3, 4]. To protect, promote and support breastfeeding, The United Nations Children's Emergency Fund (UNICEF), The World Health Organization (WHO), and other stakeholders developed the International Code of Marketing BMS (hereafter referred to as the Code). Because of the Code, member states are expected to enact national laws to regulate the promotion of BMS. The Code and national Regulation implementation is mainly the responsibility of the health worker because they have personal access to pregnant women, breastfeeding mothers, and their families [5, 6]. Successful implementation requires health workers to have a good level of knowledge if they must protect, promote, and support breastfeeding.

Several studies on the global platform reveal that health workers have poor

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knowledge of implementing the provision of the Code or their national laws on the marketing of BMS. These findings were in Indonesia, Mexico, Pakistan, Brazil, and Croatia [7, 1, 8, 9-12]. Findings in the African Region were consistent with those at the global level. In South Africa, health workers had never heard of their South African regulations [13]. Similar results were found in Côte d'Ivoire, Togo and Burkina Faso [14-16]. Contrary to findings elsewhere, health workers in Vietnam demonstrated clear comprehension of the Code [11].

Zambia domesticated the Code, through the enactment of Statutory Instrument (SI) No. 48 of 2006, Regulations (thereafter called Regulations) on the marketing of BMS [17, 18]. A study was conducted in Zambia by [19], to assess the level of non-compliance with the Code and/or SI No. 48 of 2006. This study focused on manufacturers and retailers. Therefore, to the best of our understanding, the current study is the first one to assess the level of knowledge of hospital-based health workers, towards Zambia's Regulations on the marketing of BMS. We also could not find much on this topic from countries of similar settings as Zambia; therefore, our study may be broadly applicable within the Sub-Saharan Africa region.

Understanding the level of knowledge of health workers towards implementing the provisions of these Regulations is a prerequisite to its effective implementation and subsequent contribution to reduced morbidity and mortality among children less than 5 years. The BMS Regulations make health workers better placed to change the behaviour of society in upholding breastfeeding as the gold standard for optimal infant nutrition, a health requirement and a critical component to newborn and child survival. Upholding these Regulations can translate into a) reduced financial expenditure on the cost of purchase of BMS and designated products; b) reduced cost of medical expenses as a result of morbidity due to the harmful effects of BMS and designated products; c) increased productivity resulting from the availability of more time saved in preparation of BMS and improved economic development for individuals, families, communities and the nation at large. Understanding the level of knowledge will help decision-makers and policymakers to develop informed decisions on the effective implementation of Zambia's Regulations on the marketing of BMS.

Methodology

Study Design and Location

The study was a mixed-method cross-sectional study. It employed both quantitative and qualitative methods to collect data on the knowledge of health workers, towards Zambia's Regulations on the marketing of BMS, from the only third-level, six second level and six first-level hospitals in Southern Province.

Study Participants

Study participants were health workers, administrators and managers who care for neonates, infants, pregnant and breastfeeding women.

Exclusion and Inclusion Criteria

Health workers, administrators and managers who care for neonates, infants, pregnant and breastfeeding women working in the study location were included. Students and interns who care for neonates, infants, and pregnant and breastfeeding women working in the study location were excluded.

Sampling Technique

Probability proportional to size (PPS) was used to calculate the estimated sample size of 384. After adjusting the sample size upwards for the assumed non-response rate the sample size is 410. The sample size was calculated from the only 3rd level hospitals, all the 2nd

and 1st-level hospitals in the Southern Province of Zambia. These three levels have varying target populations. From all three levels, all health workers who care for neonates, infants, and pregnant and breastfeeding women were listed by name; position; work area; contact number, and email address in a sampling frame. A proportional sample size was calculated for each hospital at all three levels as shown in Table 1. The table shows the sample size distribution among the six-level hospitals. The calculated total sample size for 1st-level hospitals is 114.

Table 1. 1st Level Hospital Sample Size Calculation and Distribution

Hospital	**Total population (health workers who care for neonates, infants, pregnant and breastfeeding women)**	**Sampling fraction**	**Sample size**
Gwembe	20	0.11	13
Kafue Gorge	25	0.14	16
Kazungula	5	0.03	3
Kalomo	14	0.08	9
Siavonga	66	0.38	43
Namwala	45	0.26	29
Total	175	1	114

Table 2 presents the sample size distribution among the six 2nd-level hospitals. The calculated total sample size for the 2nd-level hospitals is 238.

Table 2. 2nd Level Hospital Sample Size Computation

Hospital	**Total population (health workers who care for neonates, infants, pregnant and, breastfeeding women)**	**Sampling fraction**	**Sample size**
Monze	67	0.18	43
Maamba	40	0.11	26
Choma	98	0.27	64
Macha	44	0.12	29
Chikankata	40	0.11	26
Mazabuka	76	0.21	50
Total	365	1	238

There is only one 3rd-level hospital in the Province. The sample size calculation, therefore, was done directly as a proportion of all three levels to give a total final sample size calculation as shown in Table 3.

Table 3. Total Sample Size Computation

Hospital level	Total population (health workers who care for neonates, infants, pregnant and, breastfeeding women)	Sampling fraction	Sample size
Level 3	88	0.14	57
Level 2	365	0.58	238
Level 1	175	0.28	115
Total	628	1	410

The sample fraction for each hospital was used to calculate each hospital's sample size from the total target population. Each member from the total target population was assigned a unique number. A random number generator was used to randomly select the respective participants from each hospital.

Sample Size Calculation

$$n = \frac{z^2 p(1-p)}{e^2}$$

z Is the statistic that defines the level of confidence, in this case, the z value was 1.96.

p Is the proportion used in the estimation formula, in this study p is 50% because there is currently no data on the level of knowledge of health workers who care for neonates, infants, and pregnant and breastfeeding women, on Zambia's Regulations on marketing BMS.

e Is a measure of precision, thus the margin of error. In this study, the margin of error is set at 0.05

Here is the estimated sample size:

$$n = \frac{1.96^2 0.5(1-0.5)}{0.05^2} = 384$$

Adjusting the sample size upwards for the assumed non-response rate (*r*) then the sample size was adjusted as follows:

$$n_f = \frac{n}{r}$$

Where the final is sample size and *r* is the response rate in decimals which is 93.75% (0.9375) in accordance to the ZDHS of 2013-2014 [21].

$$n_f = \frac{384}{0.9375} \approx 410$$

Data Collection

For the quantitative study, an online structured questionnaire was used to collect data from 384 participants, 410 after adjusting for non-response. The questionnaire was developed from literature reviews on "Zambia's Regulations on Marketing of BMS" and from "A Common Review and Evaluation Framework".

Health workers' knowledge was defined as "good" or "poor" based on Bloom's cut-off point. Knowledge response was answered as "Yes", "No" and "Not sure". "Yes" was given a score of 1, while "No" and "Not sure" was given a score of 0. Health workers with knowledge scores above 60% were considered as having good knowledge, while those with a score below 60% were considered as having poor knowledge.

A letter requesting permission to collect data from respondents was written and sent, and feedback was received. The questionnaire was pretested through an online pilot study in non-study sites. This was to test data collection instruments in readiness for the main study. Observed flaws in the questionnaire were corrected and the questionnaire was finalized. A questionnaire link was then sent to participants through individual emails.

For qualitative data, an interview guide was developed and used to collect data from

hospital administrators and managers. All the interviews were conducted by the Principal Investigator in person. An appointment was made to each hospital to agree on a suitable date and time for the interviews. The interviews were recorded and transcribed verbatim by the Principal Investigator. The interview guide comprises open-ended questions which were administered face-to-face, to a total of 26 hospital administrators and managers. To maintain anonymity, there was no identifying information appearing in the transcripts or other study documentation. Audio files, transcribes and, consents were stored in a locked safe in the Principal Investigators' office. The Principal Investigator was the only person with access to the locked audio files, transcribes, and consents. Each participant was informed as follows: a) results of the study may be published or presented at conferences, but utmost confidentiality was going to be maintained. b) The socio-demographic data was going to be reported as a group. c) The codes were anonymous. d) The computer with the study was going to be password protected. The participant's information sheets and consents applied to both the qualitative and quantitative data collection process. Participants were interviewed face-to-face once. All interviews took place in a private area chosen by each participant. Each interview took 15-20 minutes.

Data Analysis

Quantitative data was analyzed using the Social Statistical Package for Social Sciences (SPSS).

Indexes for knowledge were constructed from the respective questions. The knowledge index was constructed from 26 related questions. The knowledge results were described in terms of frequencies and percentages using descriptive statistics. The knowledge test was conducted using univariable linear regression analysis. The two (2) significant variables were taken to the next stage of multivariable regression analysis. A p-value of <0.05 was considered statistically significant.

Qualitative data analysis involved a hybrid approach. It combines deductive (grouping data with some preconceived themes, based on knowledge, attitude and practices theory) and inductive (allowing the data to determine the theme) approaches. Audio recordings from the interviews were transcribed. The speech was converted to text word for word. Transcribes were read through and initial notes taking was done. The process was taken through four (4) stages. Stage 1 was the initial coding stage. Initial sets of the codes were developed through highlighting sections of the text into phrases or sentences and coming up with shorthand labels or "codes" to describe the content A combination of descriptive and structural methods of coding was done. In stage 2 the line-by-line coding was done. At this stage, additional codes were assigned. Stage 3 involved moving from data coding to analysis. Within stage 3 there were 2 steps. Step 1 was code categorization, where similar or related codes were bundled. This facilitated the visualization of new connections between different codes. In Step 2, themes in the data set were identified and synthesized. A thematic analysis was then conducted.

Ethical Consideration

Ethical clearance was sought from the Excellence of Research Ethics and Science (ERES) Converge Institutional Review Board. The request to conduct research was sought from the National Health Research Authority. A participant information sheet explaining the overall purpose of the study discomforts and potential risks, benefits, and rewards, confidentiality was given to participants for consent. The participant information sheet included the fact that feedback will be given to them on the findings of the study.

Limitation of the Study

It is important to note that this study was conducted in hospitals only. Therefore, the results of this study cannot be generalized to health workers who work in health facilities at the primary health care level which offer services to neonates, infants, pregnant and breastfeeding women.

Results

Socio-demographic Characteristics of Health Workers

A total of 410 eligible health workers were sent an online questionnaire out of which 401 answered it. Table 4 presents the study participants' socio-demographic characteristics. The majority 334 (83.3%) of the study participants were females. Slightly more than one-third 139 (38.9%) of them were from the age range of 31–44 years of age. The majority 338 (84.3%) of the participants had a diploma. About two-thirds 276 (68.8%) of the participants were midwives with nearly a third 121 (30.2%) having had work experience of less than 5 years. More than half 232 (57.9%) of the study participants were stationed in the 2nd level hospital more than half 208 (51.9%) worked in the labor and delivery ward.

Table 4. Frequency of Participants Based on Socio-demographic Characteristics (n=401)

Variable	Categories	Frequency	%
Gender	Male	67	16.7
	Female	334	83.3
Age (years)	≤30	139	34.7
	31-44	156	38.9
	≥45	104	25.9
	999	2	0.5
Level of qualification	Certificate	26	6.5
	Diploma	338	84.3
	Degree	35	8.7
	Post graduate degree	2	0.5
	Other (specify)	0	0.0
Other qualification		401	100.0
Type of Profession	General nurse	84	20.9
	Midwife	276	68.8
	Doctor	25	6.2
	Nutritionist	16	4.0
Number of years worked	≤5	121	30.2
	6-10	112	27.9
	11-15	63	15.7
	16-20	87	21.7
	20+	18	4.5
Hospital level	3rd level	56	14.0
	2nd level	232	57.9
	1st level	113	28.2
Duty area	Antenatal	19	4.7

	care (ANC)		
	Labor and delivery ward	208	51.9
	Postnatal care (PNC)	51	12.7
	Neonatal Intensive Care Unit (NICU)	26	6.5
	Pediatric	80	20.0
	Nutrition Department	17	4.2
	Other	0	0.0

Univariable Association Tests Related to Zambia's

Regulations on Marketing of BMS and Selected Demographic Characteristics

The univariable results in Table 5 indicate the strength of significance of the association found between each demographic characteristic and knowledge relating to Zambia's Regulations on the marketing of BMS. Tests were conducted using univariable linear regression analysis.

Table 5. Univariable Association Tests Between Socio-demographic Characteristics and Knowledge Related to Zambian's Regulations on Marketing of BMS

Variable	Knowledge
Gender	*p>0.05*
Age	*p>0.05*
Qualification	*p>0.05*
Profession	*p=0.074**
Years Worked	*p>0.05*
Hospital-Level	*p<0.05***
Duty Area	*p>0.05*

Only TWO (2) variables or factors in Table 5 showed borderline to strong significance of association with knowledge. 'Profession' showed borderline significance, while 'Hospital level' showed strong significance with the three outcomes knowledge. The rest of the variables did not show a statistically significant association with knowledge in the univariable tests of association.

Therefore, the TWO (2) significant variables (profession and hospital levels) were taken to the next stage of multivariable regression analysis of each of the knowledge outcome. The results of the regression tables for knowledge are shown in Table 7.

Health Workers' Knowledge (Awareness and Familiarity)

Table 6 presents knowledge (awareness and familiarity) of participants' findings. Only 189 (47.1%) participants were aware of the Regulations and less than half 183 (45.6%) of them were familiar with A total of 161 (40.1%) were either trained or oriented on the regulations. One-third 133 (33.2) were aware that there was a copy of the Regulations at their facility for them to use. Less than one-third 127 (31.2%) were aware of the use of these Regulations to promote, protect and

support breastfeeding. The same number 127 (31.2%) of participants were aware of how Regulations would help them counsel mothers and families against the use of feeding bottles, teats, and pacifiers. Only 127 (31.2%) were aware that Regulations could help them promote the appropriate preparation and use of BMS. Similar results were reported from the qualitative analysis.

Only 162 (40.4%) had seen hospital-based guidelines/protocols/standard operating procedures, (publicity material) to promote breastfeeding. These protocols expected to be seen are Zambia's Regulations on marketing BMS, the ten steps to successful breastfeeding, posters on exclusive breastfeeding and early initiation of breastfeeding within the first hour of birth. Among these, it was not unusual for those who had been trained to have seen all the guidelines/protocols/standard operating procedures. This is because the same are presented during the training. The most commonly seen guideline among them all was the poster on the ten steps to successful breastfeeding. For those who had seen the posters they mostly reported to have seen handwritten ones. This is an indication of the willingness of some health workers to promote breastfeeding. However, one participant reported having seen a poster on infant formula in her ward. When probed further, she responded that she had been seeing it but was not aware that it was against the Regulations. Regulation 4 prohibits any such displays.

Results showed fewer participants were aware that their health facility should not be used for purpose of BMS and designated products: promotional materials132 (32.9%; display 132 (31.7%); distribution of equipment or materials that bear a company name, logo, trade mark or any designated product 129 (32.2%); note pads 127 (31.7%); pens 127 (31.7%); calendars 127 (31.7%); children's clinic cards 127 (31.7%); toys 127 (31.7%); or posters 127 (31.7%). Similar results were reported from the qualitative analysis.

Very few participants were aware that, relevant authorities were not permitted to grant permission for the supply of any donations of designated products. However, this permission would only be granted on condition that they are satisfied with the intended use. The major five (5) intended uses are medical conditions, orphaned children, an orphanage, and infants in an emergency/disaster residing in an orphanage. The same results 127 (31.7%) were found for all the five (5) mentioned uses. If supply was necessitated only 130 (32.4%) were aware of the period the supplier was required to maintain supply. However, only 9.7% were aware of the correct period. A similar level of awareness 133 (33.2%) on participant's knowledge that they are not allowed give or to accept from a manufacturer or distributor, or any person on their behalf financial or material support. Such includes, BMS or designated product, any contribution, scholarship finances, or otherwise whatever value. Similar findings were reported from the qualitative analysis. Very few (40.4%) participants had seen the; a) Zambian Regulations on the marketing of BMS; b) early initiation of a baby to the breast an hours after birth; c) exclusive breastfeeding and; d) the Code respectively. Similar findings were reported from the qualitative analysis.

Table 6. Frequency Response of Participants to Knowledge-Related Questions (n=401)

Knowledge questions	**Responses**	
	N	**%**
Are you aware of Zambia's Regulations on the marketing of BMS?	189	47.1
Are you familiar with the contents of Zambia's	183	45.6

Regulations on marketing of BMS?		
Are you trained/oriented on Zambia's Regulations on the marketing of BMS?	161	40.1
Is there a copy of Zambia's Regulations on marketing BMS at your facility for you to read?	133	33.2
Do Zambia's Regulations on the marketing of BMS help you to:		
• promote, protect, and support breastfeeding?	129	31.2
• counsel mothers, and families against the use of feeding bottles, teats, and pacifiers	129	31.2
• promote the appropriate preparation, and use of BMS	129	31.2
Have you seen any hospital-based guidelines/protocols/standard operating procedures on the promotion of breastfeeding?	162	40.4
Are you aware that your health facility should not be used for the purpose of promoting the use of BMS or a designated product such as:		
promotional materials?	127	31.7
displays?	132	32.9
distribution of equipment or materials that bear BMS or designated products' company name, logo or, trademark?	129	32.2
Are you aware that your health facility should not be used for the distribution or display of the following to promote the use of BMS or a designated product:		
note pads?	127	31.7
pens?	127	31.7
calendars?	127	31.7
children's clinic?	127	31.7
toys?	127	31.7
posters?	127	31.7
Are you aware that relevant authorities should not grant permission for the supply of any donations of a designated product unless it is satisfied that it is used for/on:		
medical conditions?	127	31.7
orphaned infants?	127	31.7
orphanages?	127	31.7
abandoned infants during an emergency/disaster?	127	31.7
infants residing in orphanages?	127	31.7
If supply is necessitated do you know the period the supplier is required to maintain supply?	130	32.4
Are you aware that you are not allowed give or to accept from a manufacturer or distributor or any person on their behalf for the purpose of promoting BMS or designated product any of the following:		
gift of BMS?	133	33.2

contribution or benefit?	133	33.2
finances or otherwise whatever value?	133	33.2
scholarship?	133	33.2

Regression of Level of Knowledge of Health Workers

The mean overall level of ***GOOD KNOWLEDGE*** relating to implementing Zambia's Regulations on the marketing of BMS in the studied population of health workers is **0.339** or **34%** [**SE:** 0.0221; **95%CI:** (0.2959, 0.3828)].

Table 7. Regression of Knowledge on Profession and Hospital Levels

Knowledge Index	**Co-efficient**	**Std. error**	**t**	**p>[t]**	**[95% conf.**	**Interval**
Profession						
General nurses	-	-	-	-	-	-
Midwives	-.2250895	.546438	-4.12	0.000	-.3325185	-.1176605
Doctors	-.1712506	.0985086	-1.74	0.083	-.3649174	.0224162
Nutritionists	-.0908243	.118048	-0.77	0.442	-.3229053	.1412567
Hospital level						
3rd level	-	-	-	-	-	-
2nd level	-.0528127	.0650286	-0.81	0.417	-.180582	.070329
1st level	-.2035584	.0717295	-2.84	0.005	-.3445777	-.0625391
_cons	.5964856	.0770109	7.75	0.000	.4450831	.7478881

According to the regression results in Table 7, general nurses had the highest knowledge of Zambia's Regulations on the marketing of BMS. This was followed by nutritionists (difference =0.091), doctors (0.171), and lastly midwives (0.225), after controlling for hospital level. However, the difference between general nurses and nutritionist is not statistically significant (p=0.442), which means that the knowledge about the marketing of Zambia's Regulations on the marketing of BMS between general nurses and nutritionists is almost the same.

According to the regression analysis knowledge about the marketing of Zambia's BMS Regulations was highest at the 3rd level hospital (Livingstone UTH), followed by the 2nd level hospitals (Macha, Monze, Mazabuka, Chikankata, Maamba, and Choma), showing (difference 0.053) and lastly 1st level hospital (Kazungula, Gwembe, Siavonga, Kalomo, Kafue Gorge and Namwala) showing (difference -0.204), after controlling for the profession.

Results of Thematic Analysis

A total of 26 hospital administrators and managers participated in the study out of which most (n=14) were male and the rest (n=12) were female. The highest number (n=16) were in the age bracket 31-44 years, followed by those above 45 years (n=8) and lastly those less than 30 years (n=2). The majority (n=16) had worked for between 6-10 years, followed by those that had worked for between 16-20 years (n=8) and finally those who had worked for ≤5 years (n=2). Respondents' accounts in relation to their knowledge towards Zambia's Regulations on the marketing of BMS were captured.

Knowledge on Zambia's Regulations on Marketing of BMS

Participants were asked questions about their level of knowledge of the Regulations. When asked whether they were aware of these

Regulations, most of them said they did not know anything, were not sure, or did not know much.

"Umm … here think I that I should say I don't know anything".

"I don't know much".

"I am not so sure about those Regulations"

One participant exhibited some level of knowledge about the Regulations.

"Zambia's Regulations on the marketing of BMS regulate the marketing and use of BMS".

Most of them did not respond to how these Regulations helped them promote breastfeeding. However, one participant had some knowledge.

"They remind me on what course of action to take when counseling mothers and family members on infant feeding recommendations for Zambia".

All participants except two had not been trained or oriented on BMS Regulations. One of them said she attended a related course called Baby Friendly Health Facility Initiative (BFHFI). The content of this course includes a session on Zambia's BMS Regulations.

"I was trained by you in BFHFI many years ago".

Most had not seen any kind of guidelines/protocols/standard operating procedure on the promotion of breastfeeding they had seen only one of them:

"From what I recall I have seen the 10 steps to successful, breastfeeding, handwritten posters on the importance of exclusive breastfeeding, early initiation of a baby to the breast within one hour of birth, and rooming in where the baby is supposed to be with the mother all the time".

One health worker reported having seen a poster on the promotion of infant formula

"coming to think of it ah…I think I have seen a poster on infant formula on my ward".

On how a health worker would know that personnel from manufacturers of BMS and designated products have access to mothers within their ward/facility some said:

"Actually, it is very easy to know because you can see the infant formula, feeding bottles, and teats with the mothers or with a bed-sider (mother's helper)".

When asked whether they were aware that as relevant authorities should not grant permission for the supply of any donations of the designated product unless satisfied with the intended use, most concerted to that knowledge.

"I would grant permission if the mother has breast conditions or maybe she dies. Let me say, in some cases, the mother may refuse to breastfeed if she is mentally disturbed after birth. As you know now we have seen families being displaced by the floods with mothers very emaciated, and so to save both I have granted that permission to buy and give infant formula to the baby."

On the period the supplier should maintain a supply of infant formula if necessitated, these were several responses:

"The period uum… it varies depending on the eeh… the capacity of the family, but a child is supposed to take infant formula for up to 2 years of life".

"I think this shouldn't be for a long period, I can mention for example that this can be given temporarily like to a breastfeeding mother or mother who is sick, so I expect that infant formula should be given for a few hours to few days".

"A mother can do exclusive replacement feeding for 6 months,

this is according to AFASS if they are able to afford and sustain according to their income".

"Maximum, infant formula should be given for 5 days, and within 5 days I expect everything to fall into place if someone has had an operation. I expect that at least they should be able to start breastfeeding properly if there has been a delay for breastmilk to start coming out".

"Uum okay the… I would propose uum… in the first one year".

"It depends on the supplier; others would say 6 months others up to a year".

Discussion

This study sought to assess the level of knowledge of health workers who care for neonates, infants, pregnant and breastfeeding women in hospitals of Southern Province, towards Zambia's Regulations on marketing of BMS. To implement these Regulations health workers are required to have good knowledge about the provisions contained therein. However, despite Zambia having enacted national legislation to regulate marketing and the promotion of BMS, our findings show that the level of knowledge among health workers is poor. Suffice to say that successful implementation of these Regulations requires health workers to have a good level of knowledge. Our study was around the number of health workers who reported having been aware, familiar, seen hospital-based guidelines/protocols/standard operating procedures, or seen a copy of Zambia's BMS Regulations. The results were in line with the findings from the qualitative analysis. Such results can be attributable to a few health workers who have either been trained or oriented in an infant feeding-related course. The training's content includes a session on marketing BMS. Our study findings are consistent with results from Indonesia, Mexico, Pakistan, Brazil, Croatia, and South Africa where health workers had poor or no knowledge of either their BMS legislation or the Code [7, 1, 8, 2, 9-15]. The same results were reported in Côte d'Ivoire, Togo, and Burkina Faso [14-16]. Contrary to our findings, health workers in Vietnam demonstrated clear comprehension of the Code, thus suggestive of very strong policies [12]. Other contrary results from our findings were reported in Kenya where nurses were highly knowledgeable about Kenya's BMS Act [20]. The need for training if health worker have to be knowledgeable was qualified in Nyaboke's study [20].

To counsel pregnant and breastfeeding women or their families, promote, protect and support breastfeeding, appropriately prepare BMS (only when necessitated) health workers require knowledge on BMS Regulations. Knowledge these Regulations by health workers was observed to be low and positively associated only two demographic characteristics. *"Health workers in hospitals of Southern Provinces do not have good knowledge of Zambia's marketing of BMS Regulations".* General nurses had the highest knowledge of Zambia's Regulations on the marketing of BMS. A study conducted in Kenya by Nyaboke [20] reported that nurses were highly knowledgeable about Kenya's BMS Act. Similar findings were reported in Vietnam [11]. In terms of nurses superseding all other cadres, this finding was not anticipated. By design counselling on infant feeding choices and practices starts during pregnancy in ANC. This continues during labour and delivery and goes on through the breastfeeding period in PNC wards and thereafter. If the infant falls sick, has a disorder which prevents breastfeeding, has a low birth due to prematurity or is small for dates, they are admitted to either NICU or Pediatric ward. During any of the aforesaid situation counselling on infant feeding choices and practices continues. The proportion of

neonates or infants passing through ANC, labour and delivery is highest at any hospital level. This means that any pregnant and breastfeeding woman or their families who have a neonate or infant admitted to NICU or Pediatric should have already been counselled at one of the stages in the cycle. Midwives must provide infant feeding information. Our findings show that this is not the case. The consequence of such a scenario is that fewer women are counselled on infant feeding choices and practices than the number that would have been counselled if the highest number with knowledge about the Regulations was among midwives. This has a negative implication on promoting, protecting and supporting breastfeeding, a gold standard for child survival. It provides an opportunity for uninformed health workers not to comply with Regulations on BMS marketing. It also compromises their credibility to promote, protect and support breastfeeding.

Interestingly, the second highest level of knowledge was among nutritionists and midwives came third. However the difference in knowledge about the Regulations between general nurses and nutritionists was not (almost the same) statistically significant. It was anticipated that nutritionists should have had the highest level of knowledge of BMS Regulations. Nutritionists by profession have a moral duty to counsel pregnant and breastfeeding women and their families on optimal infant feeding. The observed level of knowledge among them instigates many questions. One wonders whether, the low level of knowledge is due to lack or inadequate in-service or pre-service training or due to their poor attitude.

Our findings show that knowledge about the marketing of Zambia's BMS Regulations was highest at the 3rd level hospital (LUTH). This was followed by the 2nd level hospitals after controlling for the profession. The cascade in level of knowledge observed is anticipated given level of services provided. LUTH is a university teaching hospital and is a centre of excellence. It provides specialized services and it is a referral hospital for 2nd-level, while 2nd-level hospitals are referral hospitals for 1st-level hospitals. This could explain the observed hierarchy in the level of knowledge. Important to note that despite there being a high level of knowledge among health workers these levels are poor reported at 31% against the expected backdrop of a 60% cut-off.

Conclusion

The study mixed-method cross-sectional assessed the level of knowledge among health workers in hospitals of Southern Province towards marketing of BMS Regulations. In the study, health workers were not knowledgeable about implementing Zambia's Regulations on marketing of BMS. The findings show that there was no association between gender, age, qualification, the number of years worked, and the duty area. However, there was an association between knowledge and profession and hospital level. Though general nurses exhibited a higher level of knowledge than the anticipated high level among midwives, these levels were still lower than the set cut-off. The study also established that health workers at the 3rd level, as a tertiary hospital had better knowledge towards implementing Zambia's Regulations on the marketing of BMS. Our findings from the quantitative and qualitative studies, show that the level of knowledge among health workers in hospitals of Southern Province, Zambia was poor.

Recommendations

Based on the findings of this study it was revealed that there is poor knowledge among workers who care for neonates, infants, pregnant and breastfeeding women the following recommendations are made:

1. It is necessary for Ministry of Health to include a mandatory baby friendly health facility initiative course for all

health workers who care for neonates, infants, and pregnant and breastfeeding women during pre-service and in-service training.

2. The Ministry of Health should orient managers and administrators upon deployment on Statutory Instrument No. 48 of 2006. The Food and Drug Act (Laws, Volume 17, Cap 303) Food and Drugs (Marketing of Breast Milk Substitutes) Regulations should be mandatory. This is to create awareness of the need to protect, promote and support breastfeeding within the hospitals.
3. Ministry of Health should ensure that law enforcement officer adhere to an aggressive re-enforcement of the Statutory Instrument No. 48 of 2006. The Food and Drug Act (Laws, Volume 17, Cap 303) Food and Drugs (Marketing of Breast Milk Substitutes) Regulations.

Declaration of Conflict of Competing Interest

There are no organizations with a conflict of interest in the study. The author declares that they do not have any financial or personal relationship that might have wrongly influence the writing of the paper.

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