

Knowledge and attitudes of community health workers in Ecuador regarding the prevention of chronic malnutrition in children: results of a cross-sectional exploratory study

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ABSTRACT

Objective To explore the prior knowledge and attitudes of community health workers (CHWs) in Ecuador regarding chronic malnutrition in children (CMC) in order to identify the needs and improve their capabilities to address this issue in their communities.

Methods A cross-sectional exploratory study with a mixed-paradigm social approach. A virtual questionnaire adapted from the Food and Agriculture Organization (FAO) Knowledge, Attitudes, and Practices (KAP) survey was administered to 111 CHWs from Ecuador's Ministry of Health, operating in communities prioritised by the state due to high rates of Chronic Malnutrition in Children (CMC). The questionnaire assessed knowledge and attitudes regarding anaemia, CMC, drinking water, breastfeeding, complementary feeding and feeding during pregnancy. Descriptive and bivariate analysis was performed using SPSS V.24.0 for the closed questions, and qualitative analysis through deductive coding using MAXQDA for the open questions of the questionnaire.

Results The mean knowledge score was 6.6/9 points (SD 1.43). Significant differences were observed based on experience ($p < 0.05$), with lower scores among CHWs with less than 1 year of experience. While 88.3% identified at least one cause of CMC, only 60.4% could identify consequences. CHWs showed greater knowledge about feeding during pregnancy and breastfeeding practices than about complementary feeding (44.14% adequate responses). CHWs reported high confidence in providing advice on CMC prevention, breastfeeding and nutrition during pregnancy, but lower confidence in using the country's dietary guidelines. Qualitative analysis revealed important barriers such as families' lack of financial resources and limited access to drinking water.

Conclusions The results demonstrate the need to improve CHWs' understanding of adequate nutrition from pregnancy to 2 years of age, and the use of the country's dietary guidelines. It is necessary to strengthen their capacity to identify CMC risk factors in communities and better understand its consequences so they can promote behavioural changes and mobilise their communities to address this issue.

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Chronic malnutrition in children continues to affect millions worldwide, reflecting familial, community and structural causes that require comprehensive policies and programmes.
- ⇒ Community health workers are key agents in preventing chronic malnutrition in children, promoting appropriate feeding, preventive health and community mobilisation.

WHAT THIS STUDY ADDS

- ⇒ Identifies knowledge gaps among community health workers: understanding the consequences of chronic malnutrition in children, associated risk factors, appropriate complementary feeding practices and confidence in applying Ecuador's dietary guidelines.
- ⇒ Highlights perceived barriers by community health workers: lack of knowledge on healthy feeding practices and awareness of the risks of contaminated water; insufficient basic services such as healthcare and access to clean water in rural communities; and persistent food insecurity, poverty and social exclusion.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ The findings can guide more effective capacity-building programmes, design family-level and community-level interventions with greater impact, and strengthen public policies to reduce structural barriers.

INTRODUCTION

Chronic malnutrition in children (CMC) is a problem affecting millions of children across the world.¹ This phenomenon goes beyond lack of food and is related to factors such as poverty and food insecurity, access to healthcare services, hygiene practices, access to drinking water, nutrition education and gender equality in access to food resources.²

These elements evidence the complexity of CMC and the need to address it on multiple fronts.

In the context of Latin America, Ecuador is one of the countries facing important challenges on the subject of CMC. According to data from the National Office of Statistics and Census in Ecuador, in 2023 the country had the area's second highest rate for CMC, with a prevalence of 20.1% in under 2 yrs. These figures reflect the importance of implementing effective policies and programmes to address the underlying causes of CMC and promote a favourable environment for children's healthy development.^{3,4}

Although there are different factors contributing to this problem, lack of knowledge and inadequate food practices and childcare are some of the underlying causes.⁵ In this regard, evidence shows that community health workers (CHWs) play a crucial role in preventing and addressing CMC.⁶⁻⁹ These CHWs are usually trusted and respected by the families they work with, which puts them in a privileged position to influence childcare in their own communities.^{10,11} CHWs are essential for reducing disparities in health and nutrition and can perform various functions, from acting as educators in their communities to carrying out basic public and preventative healthcare interventions.^{12,13} Likewise, CHWs can act as changemakers by rallying communities to encourage changes to eating habits and address the social determinants which influence health.¹⁴

However, so CHWs can effectively perform their job, it is essential for them to receive adequate, up-to-date training on CMC, its causes and effects, risk factors and other factors linked to nutrition, and that they have the self-confidence to transmit this knowledge to their communities.¹⁵

Promoting proper maternal nutrition during pregnancy and in the early stages of a child's life is critical to ensuring optimal physical and cognitive development. Exclusive, on-demand breastfeeding during the first 6 months of life, followed by continued breastfeeding up to 2 years in combination with the appropriate introduction of complementary foods, provides the essential energy and nutrients required for the child's holistic growth. Additionally, maintaining proper hygiene and ensuring access to safe drinking water are vital to reducing the risk of infectious diseases, which significantly contribute to chronic malnutrition. These actions are directly aligned with the 1000 Days Strategy, a key period to prevent stunted growth and long-term health complications.¹⁶

In Ecuador, the Strategic Intersectoral Plan for the Prevention and Reduction of Chronic Child Malnutrition (2021–2025)¹⁷ incorporates a community surveillance approach. As part of this initiative, the Ministry of Public Health (MPH) conducts an ongoing process to identify and engage volunteers to serve as CHWs. At the time of the study, the MPH had a network of 700 registered volunteers. The professional backgrounds of CHWs are diverse. While some possess higher education degrees

in fields such as social work or nursing, others have no formal education.

It is also important to take into account that traditional approaches to diet and childcare may vary considerably between communities and cultures.¹⁸ These approaches are influenced by a variety of factors such as cultural beliefs, traditional practices transmitted from one generation to the next, the resources available to each community and specific environmental conditions.¹⁹ Some CHWs may follow practices rooted in cultural traditions or local beliefs, which may not be the most suitable from a child health perspective. Thus, it is essential to assess the knowledge and attitudes of CHWs in order to identify their needs and improve their skills and self-confidence regarding CMC,²⁰ considering Ecuador's dietary guidelines²¹ and the WHO recommendations.²²

This study aims to examine the prior knowledge and attitudes of CHWs in Ecuador regarding CMC. By better understanding the experiences, contexts and individual challenges of these healthcare workers, we will be able to develop strategies to strengthen their skills and abilities to CMC in their communities more effectively.

METHODS

Design

A cross-sectional study with a mixed-paradigm social approach.

A mixed-paradigm study combining positivism paradigm (quantitative data) and compressive paradigm (qualitative approaches). The quantitative component involved a cross-sectional survey design to measure knowledge and attitudes at a single point in time, while the qualitative component explored CHWs' perspectives through open-ended questions. The questionnaire assessed knowledge and attitudes regarding anaemia, CMC, drinking water, breastfeeding, complementary feeding and feeding during pregnancy. Quantitative data were analysed using descriptive and bivariate analyses in SPSS V.24.0, while qualitative responses were analysed through deductive coding using MAXQDA.

Sampling technique and sample size

At the time of the study design, the Ecuadorian MPH had 700 CHWs registered. The criteria for being a CHW with the Ministry are as follows: being 18 years or older, being familiar with the local context, residing in and being committed to the community, having an interest in participating in training programmes and being able to build trust within the community.

A non-probabilistic, intentional sampling method was employed to ensure the inclusion of CHWs from communities with critical intervention needs, aligning with the study's objectives. From the initial population, community epidemiology tutors (health professionals responsible for coordinating CHWs) identified 280 CHWs who were conducting surveillance in the prioritised cantons due to the high rates of CMC and who had not received

specific training on CMC prevention. Invitations to participate in the study, along with a questionnaire, were sent via email. Initially, 136 CHWs completed the survey; however, after a process of data cleaning (removal of incomplete questionnaires), a final sample of 111 participants was obtained (figure 1).

Collection tools

The data were collected in October 2023 by a self-administered online questionnaire in Spanish, adapted to the KAP survey designed by FAO²³ in order to measure knowledge and attitudes regarding the following issues related to nutrition: anaemia and CMC, drinking water, breastfeeding, complementary feeding and feeding during pregnancy.

Before its application, the validity of the contents was analysed by a panel of experts. Three community nutrition experts received the initial questionnaire of 45 items and a survey asking for their evaluation in terms of the relevance, coherence, comprehension and opinion of each item. The information obtained was used to detect comprehension, cultural relevance and readability problems in the items suggested. From the 45 items on the initial questionnaire, 1 question was removed and 19 were modified. The adaptations included (1) incorporating references to locally available foods and common feeding practices in Ecuador

and (2) adjusting terminology to match the local health system's nomenclature. The final questionnaire was structured in five sections (Chronic malnutrition in children and anaemia; Breastfeeding; Complementary feeding; Feeding during Pregnancy; Drinking water) and had 44 questions.

Open-ended questions were included to assess knowledge about the five topics covered. Dichotomous questions were used to attitudes, addressing susceptibility and perceived seriousness of specific nutritional problems, as well as confidence in conveying information and promoting food practices within their community.

To assess knowledge, each open-ended question was individually analysed by a nutritionist specialising in CMC, following the FAO guidelines²³ and strategy for the prevention of CMC in Ecuador.²⁴ Answers were categorised as 'knows' and 'does not know'.²³ The total score was based on the sum of correctly answered questions analysed. Questions not answered were considered as incorrect responses when calculating the total score.²⁵ The maximum score was nine points. Responses on susceptibility were 'very unlikely' and 'very likely', while answers to seriousness were 'not very serious' and 'very serious'. Confidence to advise on each of the topics included was assessed with dichotomous (yes/no) responses.

The qualitative information was collected via open-ended questions without a limit, regarding the causes and effects of CMC and the benefits and perceived barriers to food during pregnancy, exclusive breastfeeding, complementary feeding and drinking water consumption.

Data processing and analysis

The statistical analysis was performed using SPSS software V.24.0. The descriptive measures for frequency, mean and SD were calculated for continuous variables, while categorical variables were described using frequencies and percentages. Differences between participants by gender, internet access, nutritional training and virtual training and total score were calculated using the t-test for independent samples. Differences between gender and the responses to each individual question were detected using the χ^2 test. Differences between age groups, years of experience and level of studies were examined using ANOVA for one factor and Tukey's test to identify differences between groups. The significance level was set at 5% ($p < 0.05$).

Qualitative information was collected through open responses on causes and consequences of CMC, and the perceived benefits and barriers regarding: feeding during pregnancy, exclusive breastfeeding, complementary feeding and drinking water consumption. The processing and subsequent qualitative analysis was done through deductive coding (with axial codes and emerging codes) and with the help of the MAXQDA software.

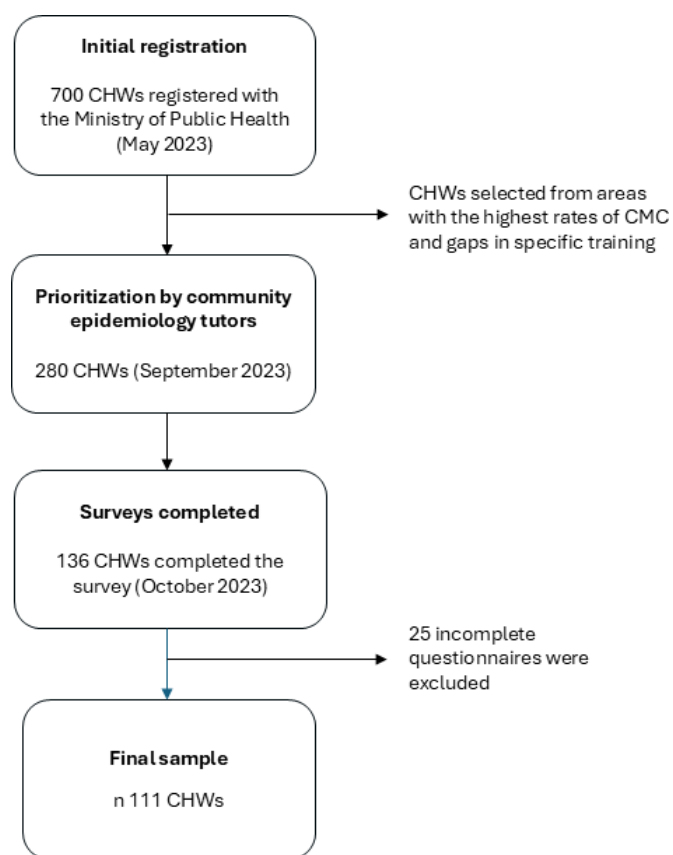


Figure 1 Flowchart of the sampling process for community health workers' (CHWs) selection. CMC, chronic malnutrition in children.

Patient and public involvement

The research question was formulated based on participants' priorities, identified through meetings with the Ministry of Health and the Technical Secretariat *Ecuador Grows Without Child Malnutrition* (STECSDI), as well as a review of similar studies. While they were not directly involved in the study's design, recruitment or execution, their perspectives informed the methodological approach. The study findings will be shared with participants via reports submitted to STECSDI.

RESULTS

The results section is organised into three main areas: first, the sociodemographic characteristics of the participating CHWs are presented; second, the quantitative findings regarding their knowledge of CMC and related topics, along with their attitudes and confidence levels in providing advice; and third, the qualitative findings that explore in depth their understanding of the causes and consequences of CMC, as well as their perspectives on key topics including exclusive breastfeeding, complementary feeding, feeding during pregnancy and drinking water practices.

Participants' characteristics

The study included 111 CHWs. The median age was 40 years, with an IQR between 30.5 and 47 years. Regarding their experience as CHWs, the median was 1 year, with an IQR between 1 and 2 years. Other key characteristics of the participants are presented in [table 1](#).

Knowledge

The average knowledge score was 6.6 (SD 1.43) out of a maximum of 9 points. Regarding total score, significant differences were only found for level of experience ($p<0.05$), with those with less than 1 year's experience attaining lower scores.

Significant differences were found between men and women as to their knowledge on the consequences of CMC ($p<0.05$), with women showing greater understanding. Knowledge regarding exclusive breastfeeding was lower among participants with a low level of studies (basic education) and participants with baccalaureate studies or higher ($p<0.05$). Knowledge regarding complementary feeding was significantly lower in the group of participants with less experience ($p<0.05$).

There were no significant differences by age group and knowledge variables or total score.

[Table 2](#) shows that, while 88.3% indicate at least one cause of CMC, this percentage decreases to 60.4% when asked to state a consequence, and 64.9% when asked to identify a risk factor for CMC. There was greater understanding of feeding during pregnancy and suitable breastfeeding practices than of complementary feeding (between 6 months and 2 years old), where only 44.14% of answers were considered adequate.

Table 1 Characteristics of community health workers in Ecuador (n 111)

Variable		N	%
Age	20-29 years old	24	21.6
	30-39 years old	30	27.0
	40-49 years old	35	31.5
	50-59 years old	18	16.2
	60 years or older	2	1.8
DK/NR	2	1.8	
Gender	Male	19	17.1
	Female	92	82.9
Level of studies	Basic education	10	9.0
	Baccalaureate/secondary education	50	45.0
	Higher education	49	44.1
	DK/NR	2	1.8
Years' experience	<1 year	63	56.8
	Between 1 and 3 years	28	25.2
	Between 3 and 5 years	10	9.0
	>5 years	7	6.3
	DK/NR	3	2.7
Internet access	Yes	106	95.5
	No	5	4.5
Nutritional training	Yes	87	78.4
	No	22	19.8
	DK/NR	2	1.8
Virtual training	Yes	52	46.8
	No	59	53.2

DK/NR, Don't Know/No Response.

Attitudes

CHWs considered CMC, anaemia and waterborne diseases to be very serious ([table 3](#)). Approximately 70% of respondents thought it probable that there were people with CMC, anaemia or diseases caused by drinking water in their communities. No differences were found based on the interviewee's gender.

CHWs' confidence is high when advising people in their communities on preventing CMC, breastfeeding, complementary feeding and feeding during pregnancy ([table 4](#)). The lowest confidence was found in the use of the country's dietary guidelines. Significant differences in confidence between men and women were found when advising on complementary feeding, with women showing greater confidence ($p<0.05$).

Causes of CMC

The qualitative exploration allowed three levels on which CHWs recognise the causes of CMC in Ecuador to be identified. The first is for family reasons, such as inadequate feeding practices in the home, lack of awareness from families about suitable feeding for each age and inadequate childcare, which is extended over time, and even reveals another issue which is the high percentage of teenage pregnancies in the region:

Table 2 Frequency and percentage of responses for knowledge-based questions on nutrition among community health workers in Ecuador (n 111)

Topics	Aspect to be evaluated	Knows	Does not know	No response
Chronic malnutrition in children	Causes of chronic malnutrition in children	98 (88.29%)	13 (11.71%)	0 (0%)
	Consequences of chronic malnutrition in children	67 (60.36%)	44 (39.64%)	0 (0%)
	Risk factors for chronic malnutrition in children	72 (64.86%)	39 (35.14%)	0 (0%)
Breastfeeding	Exclusive breastfeeding 6 months	72 (64.86%)	32 (28.83%)	7 (6.31%)
	Frequency of breastfeeding	83 (74.77%)	28 (25.23%)	0 (0%)
Complementary feeding	Varied complementary feeding	49 (44.14%)	25 (22.52%)	37 (33.33%)
Feeding during pregnancy	Supplements during pregnancy	100 (90.09%)	2 (1.80%)	9 (8.11%)
	Dietary guidelines of Ecuador	90 (81.08%)	21 (18.92%)	0 (0%)
Drinking water	Purification	107 (96.40%)	2 (1.80%)	2 (1.8%)

For example, inadequate feeding of children who do not experience the breastfeeding process for various reasons, early pregnancy, [they are] not suitable to be mothers or take on great responsibility, etc. (CHW, 48 years, female)

At the second level are community causes, such as lack of basic services in the community, highlighting the lack of access to drinking water and healthcare services during prenatal monitoring or to treat the infectious diseases which are common in the area. The third level is centred on structural causes such as food insecurity, poverty and social exclusion.

Consequences of CMC

CHWs paired up and reflected on the consequences of CMC. On one hand, they referred to less physical and cognitive development, even resulting in learning difficulties, weakness and apathy. On the other hand, they highlighted its repercussions on personal health generally, including greater risk of having anaemia, obesity or diabetes in the future, and even other diseases which may lead to death due to complications:

Malnourished children are at much greater risk of having serious or fatal diseases such as pneumonia, malaria, diarrhoea and measles. (CHW, 29 years, female)

Feeding during pregnancy

For almost all CHWs, a nutritious diet during pregnancy has direct benefits on the developing baby. They believe that a varied diet is necessary for good foetal growth and development and is related to an adequate birth weight. In addition, some also noted the pregnant women's health and decreased risks during pregnancy and birth as benefits.

Because it is essential to keep the mother healthy and for the adequate development of the foetus and to prevent complications. (CHW, 23 years, female)

Because it helps the healthy development of the pregnancy or foetus and to have a healthy birth and child at the time of delivery. (CHW, 47 years, male)

On this topic, CHWs once again agree with that stated on complementary feeding that the barriers which may prevent a pregnant woman from having a nutritious

Table 3 Frequency and percentage of responses for questions on susceptibility and perceived seriousness by community health workers in Ecuador (n 111)

Topics	Aspect to be evaluated	Improbable/serious	Very probable/serious	No response
Chronic malnutrition in children and anaemia	Probability of minors with chronic malnutrition in children	25 (22.52%)	78 (70.27%)	8 (7.21%)
	Seriousness of chronic malnutrition in children	4 (3.6%)	104 (93.69%)	3 (2.70%)
	Likelihood of anaemia	23 (20.72%)	80 (72.07%)	8 (7.21%)
	Seriousness of anaemia	0 (0%)	108 (97.30%)	3 (2.70%)
Drinking water	Likelihood of diseases caused by consuming unsafe drinking water	22 (19.82%)	77 (69.37%)	12 (10.81%)
	Seriousness of diseases caused by consuming unsafe drinking water	3 (2.70%)	103 (92.79%)	5 (4.5%)

Table 4 Frequency and percentage of responses for confidence questions in community health workers in Ecuador (n 111)

Determinants	Aspect to be evaluated	Yes	No	No response
Chronic malnutrition in children and anaemia	Preventing chronic malnutrition in children	100 (90.09%)	3 (2.7%)	8 (7.21%)
	Food with iron	92 (82.88%)	5 (4.5%)	14 (12.61%)
Breastfeeding	Breastfeeding	104 (93.69%)	2 (1.8%)	5 (4.5%)
Complementary feeding	Type of food depending on age	93 (83.78%)	2 (1.8%)	16 (14.41%)
Feeding during pregnancy	Feeding during pregnancy	89 (80.18%)	0 (0%)	22 (19.82%)
	Use of dietary guidelines	83 (74.77%)	0 (0%)	28 (25.23%)
Drinking water	Water treatment	97 (87.39%)	0 (0%)	14 (12.61%)

diet during pregnancy include family's lack of financial resources in order to obtain nutritious food, and also the lack of awareness as to what is a healthy diet, linked to dietary customs and habits in the region which do not coincide with this idea of 'nutritious diet':

It is difficult because their economic situation does not allow them to eat nutritious diets. (CHW, 47 years, female)

Although only a few workers mention this, it is noteworthy that family dynamics themselves are noted as factors which may act as an obstacle to obtaining a nutritious diet for the pregnant woman.

Due to lack of awareness and because they do not have sufficient resources to meet all their needs, since in the majority of cases they are already responsible for other children. (CHW, 35 years, female)

Exclusive breastfeeding

The majority of CHWs spoken to highlighted its nutritional value, the baby's overall development (physical and cognitive) and the prevention of diseases including CMC and digestive disorders as the main benefits of exclusive breastfeeding:

Breastfeeding is the only nourishment the baby needs for the first six months of its life since this milk contains all the vitamins and minerals required to feed the baby and also to avoid intestinal infections in the infant. (CHW, 26 years, female)

Although infrequently mentioned, three of the CHWs also noted that bonding and attachment between mother and child is a benefit of breastfeeding. In addition, three CHWs mentioned direct benefits to the mother's health, especially as a protective factor against breast and cervical cancer:

Exclusive breastfeeding during the first 6 months is beneficial to the health of both mother and baby. It provides the best nutrition possible, strengthens the immune system and creates a special bond. It is highly recommended whenever possible for these reasons. (CHW, 41 years, female)

Along these lines, it is noteworthy that the responses of all CHWs show that they have knowledge of the importance of exclusive breastfeeding during the first 6 months of the newborn's life. They also identify some barriers

which may prevent exclusive breastfeeding, such as milk production which is insufficient for the baby's requirements and lack of guidance for women at this stage:

Because [future mothers] need better guidance to understand each of the upcoming stages [following the birth of the baby]. (CHW, 26 years, female)

Complementary feeding

All the CHWs spoken to recognised the importance of a varied diet from 6 months onwards in order to ensure the adequate growth and suitable development of the infant since it provides the nutrients when breast milk no longer satisfies the nutritional requirements at that stage. In addition, they indicated that expanding their diet allows the baby to become familiar with new foods and tastes, thus encouraging healthy eating habits.

From 6 months after the child was born, they can eat other types of food because breast milk cannot give them enough nutrients for normal development. (CHW, 55 years, female)

It is important to highlight that some workers stated that including the child in family meals also contributes to strengthening family ties.

The workers note that they find barriers in their communities to integrating a varied diet from 6 months old. On one hand, due to a lack of resources to access food with high nutritional values, and, on the other hand, due to a lack of awareness from family members as to what is a varied diet. This is linked to cultural dietary habits in the region, which are not adapted to the dietary requirements of children at this stage of their life.

Because they do not know how to provide a good diet and also for financial reasons, as the resources are not sufficient to cover all the household expenses. (CHW, 35 years, female)

Drinking water

Given the connection between waterborne diseases and CMC, CHWs were asked about their knowledge of strategies to make water safe for consumption. In response, most CHWs indicated familiarity with methods such as boiling and chlorinating water. Three of them mentioned

filtration as a strategy, while only one person referenced solar disinfection.

Although most CHWs mentioned boiling water as the best-known and most widely spread strategy, they also indicated barriers in communities to achieve this, such as a lack of awareness about the risks of using unsafe drinking water, the cost the fuel required to boil it signifies for families and lack of time or planning to do so.

It is hard, due to the lack of economic resources which make it difficult to buy gas, which is a necessary element to be able to boil water. (CHW, 37 years, male)

Regarding my sector, due to being considered a rural area, the inhabitants, who work in agriculture, are exposed to drinking and ingesting water from streams, marshes and rivers. (CHW, 47 years, male)

DISCUSSION

This study provides important insights into the knowledge and attitudes of CHWs in Ecuador regarding CMC. Key findings reveal that while CHWs demonstrate good overall knowledge, there are significant gaps in specific areas. Most notably, only 60.4% could identify its consequences, and just 44.14% showed adequate knowledge about complementary feeding. Although CHWs reported high confidence in advising on CMC prevention, breastfeeding and pregnancy nutrition, they showed less confidence in using the country's dietary guidelines. The qualitative findings highlighted important barriers at family, community and structural levels, particularly regarding economic constraints and access to safe drinking water, which affect their ability to promote healthy nutrition practices in their communities.

The integration of quantitative and qualitative findings reveals important patterns that strengthen our understanding of CHWs' knowledge and attitudes towards CMC. While 88.3% could identify at least one cause, recognition of its consequences was notably lower. This finding was enriched by the qualitative analysis, where CHWs demonstrated a nuanced understanding of CMC causes at three levels (family, community and structural), but their discussion of consequences focused primarily on immediate health impacts rather than long-term implications. Similarly, the quantitative finding of lower knowledge scores regarding complementary feeding was complemented by qualitative insights revealing that this gap may be rooted in cultural and economic barriers rather than simple lack of information. The high confidence levels reported in the quantitative survey for advising on breastfeeding were validated by the rich, detailed qualitative responses about breastfeeding benefits, suggesting genuine understanding rather than just self-reported confidence. However, some divergences emerged: while quantitative data showed high confidence in providing nutrition advice, qualitative responses revealed significant concerns about families' economic constraints and access to nutritious foods,

suggesting that CHWs' confidence might be tempered by their awareness of practical implementation challenges in their communities. These complementary findings underscore the complexity of addressing CMC and highlight the importance of considering both knowledge levels and contextual barriers in CHW training programmes.

The current situation in Ecuador regarding CMC is challenging, with results reflecting progress and critical areas which require immediate attention.⁴ The work performed by CHWs in Ecuador is key to preventing and reducing CMC due to being the link between families and healthcare services.²⁶ However, there is little information on the knowledge and attitudes of the CHWs facing this issue.²⁷ The results of this study provide relevant information which should be considered in behavioural change and capacity-building activities, alongside encouraging health and nutrition practices on the part of CHWs.^{7 25}

Research conducted on the lack of a positive impact for healthcare interventions with newborns in rural areas suggests that this may be due to CHWs not being adequately trained.^{8 28} In the context of Ecuador, the results show that CHWs' knowledge regarding the causes of CMC, nutrition during pregnancy and drinkable water is adequate, but more than a third of participants did not demonstrate adequate understanding of the consequences of CMC, the identification of risk factors or exclusive breastfeeding.

Furthermore, less than half of the CHWs had adequate knowledge of complementary feeding. This lack of awareness may be influenced by dietary habits, a factor which has been mentioned in other studies conducted in similar contexts²⁹ and by CHWs themselves as a barrier to adequate child nutrition, or by the centralisation of child nutrition policies on breastfeeding.²⁵

CHWs' confidence to transmit knowledge is high, mainly in relation to preventing CMC and promoting exclusive breastfeeding. This confidence is very positive, since as evidenced in various studies, the CHWs' connection to their community allows them to have an influence on change practices as to eating behaviour and mobilise the community to face CMC.^{30 31} The WHO emphasises that if all children under 24 months of age were optimally breastfed, the lives of thousands of children a year around the world would be saved.²² Furthermore, as noted by some CHWs, breastfeeding benefits both child and mother and encourages attachment, but it is necessary to be supported by healthcare services and the community itself, encouraging breastfeeding support groups.²²

However, the factors linked to nutrition during pregnancy, complementary feeding and the use of the dietary guidelines of Ecuador showed the lowest values. Additionally, the qualitative analysis highlighted that the lack of knowledge to guide families on how to maintain an adequate diet is one of the main barriers for CHWs. This limited understanding among CHWs is a critical factor that must be addressed to advance Ecuador's dietary guidelines.²¹ This is particularly relevant given that the

prevalence of overweight children under 5 in Ecuador has steadily increased, currently reaching 11.7%.¹

69% of CHWs stated that it is likely that children have serious diseases caused by consuming unsafe drinking water. Although the knowledge and confidence to transmit information on drinking water seem adequate, the cost of boiling water for families and lack of time or poor planning to do so may be reasons why 36.7% of homes with children under 5 years old consume water with *Escherichia coli* in this country.⁴

In our study, nearly 50% of CHWs had received some form of virtual training, and almost all (95.5%) have access to the internet either at home or within the community. A systematic review on the use of mHealth technology by CHWs in resource-poor settings identified that these technologies could improve learning and empower CHWs in their role as a bridge between communities and public healthcare services.³² This strategy may be useful for enhancing knowledge and CHWs' confidence to prevent CMC and specifically to offer adequate guidance on healthy eating.

Similar knowledge gaps among CHWs have been documented in other Latin American countries. Studies in Peru have reported comparable findings regarding limited understanding of complementary feeding practices, with knowledge scores ranging from 40% to 50%.^{5 33} Research from Colombia has also highlighted CHWs' high confidence in breastfeeding counselling but lower competency in addressing broader nutritional challenges.³⁴ These regional parallels suggest that our findings may reflect broader systemic challenges in CHW training across similar socioeconomic contexts.

The identified knowledge gaps could significantly impact CHWs' effectiveness in preventing and addressing CMC. Limited understanding of complementary feeding practices and dietary guidelines may lead to inconsistent or inadequate nutritional advice, particularly during the critical window of 6–24 months. Based on our findings, we recommend targeted training interventions focusing on (1) practical workshops on complementary feeding using locally available foods; (2) hands-on training with the country's dietary guidelines, including role-playing exercises; (3) regular refresher courses for CHWs with less than 1 year of experience; and (4) development of simplified, culturally appropriate educational materials that CHWs can use during community visits

Regarding the study's internal and external validity, several aspects should be considered. The internal validity was strengthened through rigorous methodological procedures, including expert validation of the questionnaire content and systematic data analysis using established statistical and qualitative methods. However, as participants were recruited through an open, voluntary call, selection bias might be present, as those who volunteered could potentially have higher interest and baseline knowledge in nutrition than the general CHW population. Furthermore, the self-administered online questionnaire format, while allowing broader geographical

reach and participation, introduces potential limitations. Although participants were instructed to complete the questionnaire independently, we cannot rule out the possibility of social desirability bias or consultation of online resources during completion. To minimise these potential biases, we employed several strategies: (1) the questionnaire included both knowledge assessment and open-ended questions requiring personal experience and reflection, which are less susceptible to quick online searches; (2) qualitative responses were cross-validated with quantitative data to ensure consistency; and (3) response patterns were analysed for unusual patterns that might indicate external assistance. While these limitations should be considered when interpreting the results, the consistency between quantitative and qualitative findings, along with the alignment of our results with previous studies in similar contexts, supports the validity of our findings. Nevertheless, future studies would benefit from including a more representative sample through stratified sampling methods and incorporating observational components to validate self-reported knowledge and attitudes.

In conclusion, this study identifies the knowledge and attitudes of CHWs in Ecuador in order to promote effective community strategies which allow CMC to be prevented. The results show the need to improve the understanding of an adequate diet, from pregnancy to 2 years old, and the use of the country's dietary guidelines to achieve this. It is also necessary to strengthen the capacity to identify risk factors for CMC in communities and understanding of the consequences of CMC so that CHWs can promote changes in behaviour and mobilise their communities to face this issue.

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Patient consent for publication Not applicable.

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