Knowledge and perceptions of nursing staff on the new Road to Health Booklet growth charts in primary healthcare clinics in the Tygerberg subdistrict of the Cape Town metropole district

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Abstract

Objectives: The objectives of the study were to assess the perceptions of nursing staff on the Road to Health Booklet (RTHB), to assess their knowledge of the RTHB growth charts, and to determine whether the level of knowledge was acceptable for successful utilisation of the RTHB growth charts.

Design: A cross-sectional descriptive survey.

Setting: Twelve primary healthcare clinics in the Tygerberg subdistrict.

Subjects: Nursing staff who were going to work with the RTHB on a daily basis.

Outcomes measures: The knowledge and perceptions of the nursing staff on the new RTHB were measured using a self-administered questionnaire.

Results: The study highlighted that the majority of the nursing staff did not possess sufficient knowledge to successfully utilise the RTHB. The mean score percentage for the total 12 knowledge questions was 55%. Less than a third (n = 13) of participants could correctly interpret the cut-off value for mid-upper-arm circumference. Only 38% and 52% correctly knew that -2 standard deviation for weight-for-age and weight-for-length represents underweight and wasting, respectively. Fifty-five per cent could correctly interpret the growth faltering graph. Forty-three per cent of participants felt the change to the RTHB was unnecessary, and 55% thought that mothers or caregivers would not easily understand the RTHB. More than half (n = 22) of the participants said that they had adequate knowledge to work with the RTHB, while the rest reported that they did not.

Conclusion: The RTHB has the potential to decrease the prevalence of malnutrition in children. However, to achieve this, effective usage and understanding of the RTHB is critical.

Introduction

Growth monitoring, as defined by the United Nations Children's Fund can be understood as "the process of following the growth rate of a child in comparison to a standard, by periodic anthropometric measurements in order to assess growth adequacy and identify faltering in the early stages".[1] Accurate and precise growth references found in growth monitoring tools, such as growth charts, are the foundation of growth monitoring and health promotion.

The Road to Health Chart (RTHC) for children from birth to five years, used in South African primary healthcare facilities, is based on the 1977 National Centre of Health Statistics (NCHS) reference growth data. The NCHS growth charts had a number of biological and technological drawbacks. Biological sources of error included the

fact that the referenced infants received formula feeds. The study was conducted more than 30 years ago in the USA and these feeds are no longer available. The references were also based on one geographic area and demographic standard. Technological sources of error included measurement frequency, which occurred at birth 3, 6, 9 and 12 months only. These measurements were not regular enough to describe the rapid changes in growth that took place in the first year of life. Secondly, the curve "smoothing" or "fitting" technique masked actual growth during taking of the measurements and rendered the description of growth during these times inaccurate.[2] The World Health Organization (WHO) growth standards have been developed to overcome the limitations of the previous reference standards and may provide a more sensitive benchmark with which to monitor and optimise infant and child growth.[2]

Prior to 1994, different versions of the RTHC existed in South Africa. Since 1995, the RTHC has been revised four times, with the last update in 2002.[3] The new RTHB was implemented in February 2011 and is based on the WHO growth standards. According to the National Food Consumption Fortification baseline survey (NFCS-FB-1) stunting and underweight are by far the most common nutritional problems that face South African children, affecting one in five, and one in 10, children, respectively, aged 1-9 years.[4] By contrast, on a national level, one in 10 children were classified as overweight and 4% as obese.[4] The new RTHB, with its new growth indicators, should better enable healthcare workers to target and identify this range of nutritional problems earlier.

According to a local study conducted in 1998, most professional nurses supported the concept of a RTHC, but many felt that its importance was not stressed sufficiently.[5] The knowledge of healthcare staff on growth charts was studied by Ruel et al in 1991 and astonishing results were revealed. An overall score of 3.4 out of 10 possible points was achieved by healthcare workers who were asked to complete a baseline test of their growth chart knowledge. Studies have shown that healthcare workers found the growth charts confusing and that the plotting area for weight-for-age was too small, leading to inaccurate results.[5,6] In South Africa's public healthcare sector, the RTHC was not being used effectively, and thus its curative, preventative and promotional benefits were lost.[7]

Appropriate knowledge and attitudes are necessary for adherence to guidelines, but these have been recognised as being insufficient. Potential barriers to change may still include lack of knowledge, as well as poor attitudes because of lack of supporting staff, lack of resources, facilities and motivation.[8] The challenges of low- and middle-income countries (into which bracket South Africa lies as a result of its high Gini coefficient), include the weakness of healthcare systems, lack of professional regulation, as well as lack of opportunities for the continuance of professional development.[9]

In order for the new RTHB to be successful in meeting its goal of improving the assessment of the health status of the child, healthcare workers implementing and using the RTHB require sufficient knowledge and must have an appropriate attitude toward its implementation. Therefore, the objectives of the study were to assess the perceptions of nursing staff on the RTHB, to assess their knowledge of the RTHB growth charts and to determine whether or not the level of knowledge was acceptable for successful utilisation of the RTHB growth charts.

This study was the first to evaluate the knowledge and perceptions of healthcare workers on the new RTHB growth charts in the Western Cape province.

Method

This cross-sectional survey was conducted on 12 full-time healthcare clinics in the Tygerberg subdistrict. Data collection took place in January 2011, one month before implementation of the new RTHB. Nursing staff had already undergone training on the RTHB before this study was conducted. The study population consisted of various categories of nursing staff, namely enrolled nursing assistants (ENA), enrolled nurses (EN) and professional nurses (PN) working at the 12 primary healthcare clinics in the Tygerberg subdistrict.

The nurses must have been trained on the new RTHB, had to be present on the day of data collection and had to give consent to participate in the study. Convenience purposive sampling was used to select the clinics and non-random purposive sampling of nursing staff was utilised in each selected clinic. Knowledge and perceptions were determined by means of a semi-structured questionnaire, completed by the respondents. The study received ethical approval from the University of Stellenbosch. The questionnaire was developed by the researchers and was available in both Afrikaans and English. It consisted of three sections. Section A comprised the demographic information of the nursing staff, section B tested their knowledge of the growth charts in the RTHB, and section C consisted of questions based on the nurses' perceptions of the new RTHB, assessed by means of a Lickert scale. The questionnaire was sent to experts in the field of community nutrition, to test content validity, and was piloted in a facility outside the Tygerberg subdistrict to assess face validity.

Data collection took place at the selected healthcare facilities. Questionnaires and consent forms were compiled and coded before data collection. The researchers determined the date, time and venue of data collection with each facility beforehand. A standardised introduction was given to respondents on how to complete the questionnaire and informed consent obtained. Confidentiality was assured by not recording any of the participants' personal information and by coding the questionnaires. The nursing staff completed the questionnaire individually.

Microsoft Excel® was used to capture the data and Statistica® version 9 to analyse the data. Descriptive statistics were employed to analyse the results. Summary statistics were utilised to describe the variables.

Results

Demographic characteristics

Forty-four nurses were eligible for participation in the study, of whom 42 took part. Two participants waived consent to participate in the study after they were informed what the study entailed. All the participants had worked with the RTHC and had received training on the new RTHB. Ninety-five per cent (n = 40) were women and 5% (n = 2) men. Sixty-nine per cent (n = 29) of participants were younger than 50 years of age and the remaining 31% (n = 13) were 50 years or older. Sixty-two per cent (n = 26) were PNs, 14% (n = 6) ENs, and 24% (n = 10) ENAs. The majority (n = 26) of the nursing staff had more than 15 years' experience, and 26% (n = 11) had between two and 15 years' experience. Only 10% (n = 4) had been working for less than two years (one participant did not answer this question).

The information gained during training on the RTHB revealed that 71% (n = 30) had been trained by a dietitian and 21% (n = 9) by a PN. Seven per cent (n = 3) did not know who had trained them. Training took place 2-5 months before this study, and was conducted 3-6 months prior to implementation of the booklet in primary healthcare clinics.

Knowledge of the Road to Health Booklet

The first question of the questionnaire tested whether the participants knew what the RTHB was used for. A total of 79% (n = 33) knew that it was an educational, screening, growth and health promotion tool. Table Ia details the knowledge of nursing staff on the uses of the new Road to Health Booklet. Table Ib shows that almost half of the participants (n = 19) did not know the mid-upper-arm circumference (MUAC) cut-off value. A further 19% (n = 8) of participants answered this question incorrectly. Only 31% (n = 13) of participants answered this question correctly. Most of them (n = 38) were aware that head circumference indicated brain development. Thirty-eight per cent (n = 16) and 52% (n = 22) knew that -2 standard deviation (SD) for weight-for-length and -2 SD for weight-for-age represented wasting and underweight, respectively. Seventy-four per cent (n =

31) of nurses were aware that the new RTHB was based on the WHO growth standards, whereas only 19% (n = 8) knew that the breastfed child is the reference used for these growth standards. Seventy-nine per cent (n = 33) of participants incorrectly thought that it was based on both the breastfed and formula-fed infant. More than half (n = 25) of the nurses correctly understood that Z-scores are now used as the basis of cut-off values. Twenty-one per cent (n = 9) answered this question incorrectly, and 19% (n = 8) stated that they did not know the answer. When interpreting the graphs, 55% (n = 23) were able to interpret the graph depicting growth faltering, 86% (n = 36) the graph indicating catch-up growth, and 48% (n = 20) the graph representing the underweight child. Just over half (n = 22) of participants did not know that a +3 SD on the length-for-age growth chart indicated very tall for age.

**Table Ia:** Knowledge of nursing staff on the uses of the new Road to Health Booklet

Question	Possible answers from which participants could choose						
What the RTHB can be used for	Screening and nutritional assessment tool	Education, growth, promotion, health promotion tool	Targeting tool	All of the previously mentioned factors	None of the previously mentioned factors	I don't know	Did not answer
	1 (2.38%)	6 (14.29%)	0 (0%)	33 (78.57%)	0 (0%)	0 (0%)	2 (4.76%)

Table Ib: Knowledge of nursing staff on the new Road to Health Booklet

Question	Possible answers form which participants could choose				
1. Indicate the cut-off value for MUAC	< 14.5 cm	< 11.5 cm	< 13.5	I don't know	Did not answer
	4 (9.52%)	13 (30.95%)	4 (9.52%)	19 (45.24%)	2 (4.76%)
2. What does the head circumference indicate?	Hair growth	Brain development	Future length of child	I don't know	Did not answer
	1 (2.38%)	38 (90.48%)	0 (0%)	2 (4.76%)	1 (2.38%)
3. Classification of -2 SD for weight-for-length	Overweight	Wasted	Stunted	I don't know	Did not answer
	1 (2.38%)	16 (38.10%)	10 (23.81%)	15 (35.71%)	0 (0%)
4. Classification of -2 SD for weight-for-age	Normal growth	Underweight	Overweight	I don't know	Did not answer
	5 (11.90%)	22 (52.38%)	0 (0%)	13 (30.95%)	2 (4.76%)
5. On which reference is the new RTHB based?	NCHS reference	WHO growth standards	CDC growth charts	I don't know	Did not answer
	2 (4.76%)	31 (73.81%)	4 (9.53%)	4 (9.53%)	1 (2.38%)
6. What is used as the reference for the growth charts?	Formula-fed baby	Breastfed baby	Both a formula-fed and breastfed baby	I don't know	Did not answer
	0 (0%)	8 (19.05%)	33 (78.57%)	0 (0%)	1 (2.38%)
7. On what are the cut-off values based?	Percentage of median	Z-scores	Percentiles	I don't know	Did not answer
	2 (4.76%)	25 (59.52%)	7 (16.67%)	8 (19.05%)	0 (0%)
8. Interpretation of weight-for-age growth chart indicating growth faltering	Stunting	Growth faltering	Underweight	I don't know	Did not answer
	6 (14.29%)	23 (54.76%)	12 (28.57%)	0 (0%)	1 (2.38%)
9. Interpretation of weight-for-age growth chart indicating catch-up growth	Catch-up growth	Growth faltering	Overweight	I don't know	Did not answer
	36 (85.71%)	2 (4.76%)	2 (4.76%)	1 (2.38%)	1 (2.38%)
10. Interpretation of weight-for-age growth chart indicating underweight	Underweight	Stunting	Catch-up growth	I don't know	Did not answer
	20 (47.62%)	4 (9.52%)	16 (38.10%)	1 (2.38%)	1 (2.38%)
11. Classification of +3 SD for length-for age	Very tall for age	Stunted	Overweight	I don't know	Did not answer
	10 (23.81%)	1 (2.38%)	9 (21.43%)	22 (52.38%)	0 (0%)

*: The correct answer to each question is indicated with shading. The total number of participants who answered the questions is indicated by means of a percentage: n = 42, n (%)
CDC: Centers for Disease Control and Prevention, MUAC: mid-upper-arm circumference, NCHS: National Centre of Health Statistics, RTHB: Road to Health Booklet, SD: standard deviation, WHO: World Health Organization
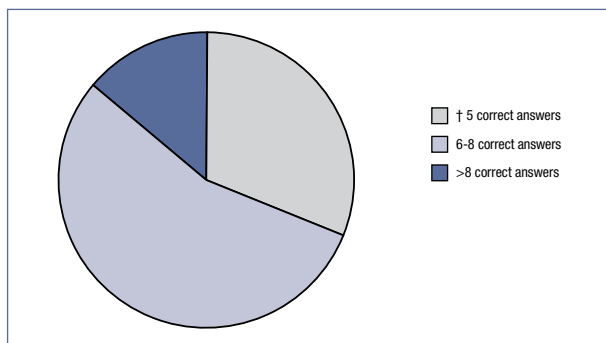
Figure 1: Total knowledge score of participants out of 12 possible correct answers

A total score was calculated for each participant from the 12 knowledge-based questions. The mean score percentage for this was 55%. As seen in Figure 1, only 14% (n = 6) of participants answered more than eight of the 12 questions correctly. Fifty-five per cent (n = 23) answered between six and eight questions correctly, while 31% (n = 13) of participants answered less than, or equal to, five of the questions correctly.

Perception of the Road to Health Booklet

Table II illustrates the perceptions of the nursing staff on the perceived significance and user-friendliness of the RTHB. Almost 70% (n = 29) of participants agreed that when compared to the RTHC, the RTHB would give a better indication of the nutritional status and growth of children in a specific population. The majority (n = 35) of the nursing staff felt that the RTHB could improve growth monitoring in their place of practice, while 48% (n = 20) indicated that the booklet was not easy to understand. Fifty-five per cent (n = 23) reported that the charts were large enough to allow for easy plotting. Ninety-five per

cent (n = 40) of the nursing staff said that the booklet plays a vital role in the fight against malnutrition.

All participants concurred that the RTHB thoroughly covers all the significant aspects of growth monitoring. When asked about the necessity of changing the RTHC to the new updated RTHB format, 43% (n = 18) of the participants felt it had been unnecessary, while 55% (n = 23) felt that mothers or caregivers would not easily understand it. Seventy-one per cent (n = 30) thought that they had sufficient skills to work with the RTHB. More than half (n = 22) of the participants said that they had adequate knowledge to work with the RTHB, while an alarming 45% (n = 19) believed that they did not have adequate knowledge to do so. None of the variables with regard to the perceptions questions reached statistical significance (p-value < 0.05).

Discussion

This study was the first to evaluate the knowledge and perceptions of nursing staff on the new RTHB in the Western Cape province. Adoption of the new RTHB and the WHO growth standards in South Africa would have a significant impact on the interpretation of children's nutritional status.[10] It will increase the likelihood of being able to classify children as stunted, overweight, and/or wasted, so that early intervention is implemented to reduce the severity and prevalence thereof.[10] It is through early identification of growth faltering and timely intervention that a reduction in malnutrition can be achieved, thus the RTHB has the potential to decrease malnutrition in children. Essentially, the potential lies in the booklet's successful utilisation. Therefore, one of the objectives of this study was to determine whether or not nursing staff had sufficient knowledge to use it effectively.

Table II: Perceptions of nursing staff on the new Road to Health Booklet

Statement	Possible answers from which participants could choose*					
	Strongly agree n (%)	Agree n (%)	Disagree n (%)	Strongly disagree n (%)	Did not indicate n (%)	p-value
1. The RTHB will give a better indication of the nutritional status and growth of children in a specific population, than the RTHC	15 (35.71%)	14 (33.33%)	10 (23.81%)	1 (2.38%)	2 (4.76%)	0.128
2. The RTHB will improve growth monitoring in my place of practice	13 (30.95%)	22 (52.38%)	6 (14.29%)	1 (2.38%)	0 (0%)	0.092
3. The RTHB is easy to understand	4 (9.52%)	16 (38.10%)	17 (40.48%)	3 (7.14%)	2 (4.76%)	0.114
4. The images and charts in the booklet are big enough to plot easily	5 (11.90%)	18 (42.86%)	16 (38.10%)	2 (4.76%)	1 (2.38%)	0.146
5. The RTHB will play a vital role in the fight against malnutrition	9 (21.43%)	31 (73.81%)	2 (4.76%)	0 (0%)	0 (0%)	0.055
6. The RTHB covers all important areas of growth monitoring thoroughly	10 (23.81%)	32 (76.19%)	0 (0%)	0 (0%)	0 (0%)	0.063
7. Changing the RTHC was unnecessary	3 (7.14%)	15 (35.71%)	18 (42.86%)	6 (14.29%)	0 (0%)	0.165
8. Mothers/caregivers will find the RTHB easy to understand	4 (9.52%)	15 (35.71%)	17 (40.48%)	6 (14.29%)	0 (0%)	0.098
9. I have the necessary skills to work with the RTHB	6 (14.29%)	24 (57.14%)	10 (23.81%)	1 (2.38%)	1 (2.38%)	0.238
10. I do not have adequate knowledge to work with the RTHB	4 (9.52%)	15 (35.71%)	18 (42.86%)	4 (9.52%)	1 (2.38%)	0.586

*: Indicated as a percentage of total participants (n = 42)
RTHB: Road to Health Booklet

Gaza and De Onis highlighted the effort by the WHO to evaluate the interpretation and appropriate use of anthropometric data. Previously, the RTHC only measured weight and did not measure height or length, or other anthropometric measurements, such as MUAC.[2] Weight-for-age does not have the biological specificity to separate height and length deficits and an excess in growth.[11] Stunting, wasting and obesity can be more accurately determined once height and length have been incorporated. The routine measurement of height and length requires more time, equipment, as well as training of healthcare workers for the correct measurement, calculation and interpretation of the additional growth indicators.[11]

The anthropometric findings in the executive summary of the NFCS-FB-1 indicate that one out of every 10 children in South Africa aged 1-9 years are underweight, and that stunting is seen in one in five children.[5] Thus, the need for the weight-for-age and length-for-age indicator to be correctly interpreted by healthcare professionals is crucial. MUAC is an indicator of poor nutritional status, as well as acute changes. It is essential that MUAC measurements are recorded on a regular basis, and compared with weight and height. MUAC is used to indicate moderate and severe wasting, which, in turn, relates to being underweight.[3] It is worrying that 64% (n = 27) of the nursing staff did not know what the cut-off for MUAC was to indicate severe acute malnutrition. This is an important aspect that healthcare professionals need to know as it allows for appropriate targeting of interventions.

This study found that more than half of the participants were unable to give a correct answer to the interpretation of a +3 SD for length-for-age. Only 52% (n = 22) and 38% (n = 16) of participants could, respectively, correctly interpret a weight-for-age of below -2 SD as underweight, and a weight-for-length of below -2 SD as wasting. Similarly, a study that was conducted in 2012 by Stellenbosch University in the Cape metropole and Cape Winelands district, identified that 72% (n = 99/138) of trained healthcare workers gave the correct answer for weight-for-age, while 32% (n = 40/126) gave the correct answer for weight-for-length. Only 52% of participants (n = 65/126) could correctly identify the -2 SD line for length-for-age.[12] It can be seen from both these studies that healthcare workers are reasonably comfortable with the interpretation of weight measurements, but less so with interpretations involving height and length.

It is encouraging that almost three quarters (n = 31) of the nursing staff were aware that the new RTHB is based on the WHO standards. However, only 19% (n = 8) knew that the breastfed child is the sole reference used for these growth standards. So it could possibly be argued that the remainder of nurses who did not answer this question correctly may not even have been aware of this fact. Exclusive breastfeeding is seen as the physiological norm with regard to how a baby should grow.[2] The WHO established the breastfed child as the norm for the growth standards. This brings coherence between the tools used to assess growth and the national infant feeding guidelines.[2] South Africa's national infant feeding guidelines of promoting exclusive breastfeeding for six months is considered the gold standard of infant feeding.[13-16]

For the purpose of this study, it was understood that if a participant had sufficient knowledge, he or she would have scored 75% and above. A total knowledge score out of 12 was calculated for each participant. Individuals who did not score above 75% were seen to not have the essential knowledge required to work with the RTHB successfully. Their effectiveness in working with the booklet would be questionable. The mean score percentage for the participants for the total 12 questions pertaining to knowledge was 55%. This score is higher than that achieved in the study by Ruel et al, where the overall score of 34% was achieved.[5] It is worrying that some of the participants believed that they did not have adequate knowledge to work with the RTHB, considering that the interpretation of growth faltering, catch-up growth and underweight remained unchanged from the RTHC.

The RTHB implementation date was extended because of delays in the printing of the booklet at national level, thus affecting the outcomes of this study. A possible reason for the less-than-average scoring could have been lack of practical implementation. The time between training and implementation of the booklet was extended by a few months. As a result, the skills that were learnt could not be exercised practically, and the nurses may have simply failed to remember what they had learnt in their training. Secondly, the level of training that was conducted may have not been appropriate, while the time that was set aside for the training may have been inadequate. Nurses' overall scores pertaining to knowledge may also have been influenced by the time spent on training, as well as the trainers' perceptions and knowledge of the booklet. A positive influence by trainers would have been essential to the success of the training.

Unfortunately, the attitude of the trainers, level of training, as well as the time spent training, could not be assessed. Thus, no conclusion could be made as to whether or not the nurses' perceptions of the booklet were preconceived or could be attributed to their lack of knowledge on it.

In addition to implementation of the new RTHB training, more emphasis needs to be placed on the rational for the changes, as well as the advantages that resulted. If nursing staff realised the reasons for the change, they may have been more open to accepting them. An attitude change is critical to the effective and successful usage of the booklet. The section of the questionnaire pertaining to perceptions indicated a level of apprehension about implementation of the booklet. It appeared as if the nursing staff had preconceived ideas about it before the study was conducted. Forty-three per cent (n = 18) of the nursing staff felt that changing the RTHC to the RTHB was unnecessary, while 57% (n=24) disagreed with this statement. An evaluation of the individual facilities is needed in order to assess the perceptions of the staff, then appropriate intervention and action to address this per facility.

If nursing staff do not feel that the RTHB is essential, the effectiveness of the booklet could be compromised. A limitation of this study was that the RTHB had not yet been implemented by the time this study was conducted. As nursing staff had not yet started to work with the booklet, practical experience was lacking. It is reasonable to say that practical experience may have positively influenced the results

that were obtained in this study. However, it is crucial that users of the booklet understand it prior to using it. A further limitation was that the study was only conducted in one subdistrict. In the case of some of the questions pertaining to perceptions, participants might have agreed with the statement simply because it was the socially desirable answer. In other words, they may have felt obliged to answer a question in a certain way, even if they felt differently.

A need for refresher courses in the facilities of the Tygerberg subdistrict is required. This recommendation would assist in improving standards of knowledge and perception among nursing staff. The assumption can be made that if nursing staff correctly understand the booklet, the education that mothers and caregivers receive will be improved, thus enhancing understanding and compliance. Fifty-five per cent of nursing staff felt that mothers would not easily understand the RTHB. The promotion of effective health and nutrition is essential in ensuring the understanding of the RTHB among mothers. This study can be seen as a baseline assessment. It would be of interest to conduct a follow-up study to examine any changes, progress or improvement with regard to the nursing staff's knowlege once the booklet has been operational for more than a year in the various facilities. It is also recommended that the study should be conducted in more than one subdistrict. Questions on perceptions about the training course, and on how to improve training, should also be included.

Conclusion

The RTHB has the potential to decrease malnutrition in children. The study has highlighted that a high percentage of nursing staff did not have sufficient knowledge of how to successfully utilise the RTHB. The mean score percentage for the questions pertaining to knowledge was only 55%. Nurses' perceptions of the booklet may also possibly hinder how effectively their knowledge is applied. Therefore the application and understanding of this booklet is critical. It is clear that retraining and an attitude change is necessary. Training relevant healthcare professionals is key to optimising the

potential benefits that the RTHB has to offer.

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