

# Validation of Training Need Assessment Questionnaire Among Health Care Workers in Reproductive, Maternal and Newborn Health Care in Low-Income Countries

**Tumbwene Elieza Mwansisya** (✉ [mwansisya@yahoo.co.uk](mailto:mwansisya@yahoo.co.uk))

Aga Khan University <https://orcid.org/0000-0002-4659-0873>

**Columba Mbekenga**

Aga Khan University

**Kahabi Isangula**

Aga Khan University

**Loveluck Mwash**

Aga Khan University

**Eunice Pallangyo**

Aga Khan University

**Grace Edwards**

Aga Khan University

**James Orwa**

Aga Khan University

**Michaela Mantel**

Aga Khan University

**Micheal Mugerwa**

Aga Khan University Hospital

**Leonard Subi**

Ministry of Health Community Development Gender Elderly and Children

**Secilia Mrema**

Mwanza Regional Health Coordinator

**David Siso**

Aga Khan Foundation

**Edna Selestine**

Aga Khan University Hospital

**Marleen Temmerman**

Aga Khan University

**Sharon Brownie**

University of Oxford Green Templeton College

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# Abstract

**Background:** Continuous professional development (CPD) trainings have been reported to enhance health care workers' knowledge and skills, improve retention and recruitment, improve quality of patient care and reduce patients' mortality. This calls for validated training needs assessment tools for facilitating the design of effective CPD programs.

**Methods:** A cross-sectional survey was conducted using self-administered questionnaires. The survey involved selected Reproductive, Maternal and Neonatal Health (RMNH) health care workers from 7 hospitals, 12 of 51 health centers and 17 of 292 dispensaries within eight districts of Mwanza Region, Tanzania. The training needs assessment (TNA) tool adapted from the Hennessy-Hicks' Training Needs Assessment Questionnaire (TNAQ) was used for data collection.

**Results:** A total of 153 healthcare workers participated in this study. The majority of participants were females 83% (127) with average age of 39 years. Nurses formed a majority of participants 76% (n=115) with relatively similar mean duration in service or in RMNH of 7.9 years. The reliability of the adapted TNAQ was found to be 0.954. Relatedly, indexes for construct validity indicated that CFI was equal to 1, Chi-square Mean/Degree of Freedom (CMIN/DF) was equal to 0.000 and Mean Square Error Approximation (RMSEA) was equal to 0.185.

**Conclusion:** The adapted TNAQ appear to be reliable and valid for identifying professional training needs of health care workers in RMNH health care settings. The tool has a considerable level of psychometric properties that makes it suitable for assessing the training needs among health care workers of different cadres. However, the applicability of the TNAQ in the wider health care systems remains unclear. Future studies with a large sample size are required to test the use of TNAQ in wider health care systems and learning opportunities.

## Background

Reproductive, maternal, newborn, child and adolescent health (RMNH) remains a challenge in the majority of low income countries. For instance, Tanzania failed to meet the Millennium Development Goal (MDG) target of reducing its maternal mortality ratio (MMR) to 228 per 100,000 live births by 2015, rather documented an increase in the national MMR from 454 in 2010 to 556 in 2016 (1, 2). In addition, the national Neonatal Mortality Rate (NMR) remains high, at 25 deaths per 1,000 live births (2). While there are many drivers of poor maternal and newborn health, a shortage of skilled human resources for health plays a major role in low income countries, particularly in the rural areas.

Continuous professional development (CPD) trainings have been reported to enhance health care workers' knowledge and skills, improve retention and recruitment, improve quality of patient care and reduce patients' mortality (3, 4). Skilled healthcare staff plays a vital role in ensuring optimal RMNH practices by communicating with care and respect, and having the requisite knowledge and technical proficiency (5). In other contexts, an estimated 20–21% of neonatal deaths can be prevented by

healthcare workers' promotion of simple, evidence-based practices such as exclusive breastfeeding and hand washing, and the prevention of hypothermia and infection (5, 6) Unfortunately, skilled staff are often not available or adequately supported as patient disrespect, patient abuse, low provider confidence and low provider skills remain commonplace in many settings (7).

One of the important tools in identification of the health care workers' knowledge and skills gaps and establishment of future CPD training profile is the training needs assessment (TNA) (3). A context specific TNA can facilitate accurate assessment of healthcare workers training needs for the successful implementation of RMNH programs (8). Furthermore, a validated TNA tool for assessment of training needs in low income countries might be helpful in identifying the underdeveloped skills, insufficient knowledge or inappropriate health care workers' attitudes. Despite the contribution of the CPD trainings in reducing MMR and Neonatal Mortality Rate (NMR), research shows that TNAs in many organizational settings have been done in an unsystematic manner or used tools that are not validated (9). This calls for validated TNA tools for facilitating the design of effective CPD trainings.

The Aga Khan Development Network (AKDN) is working with the Ministry of Health, Community Development, Gender, Elderly and Children in Tanzania (MoHCDEC) towards Improving Access to Reproductive, Maternal and Newborn Health in Mwanza, Tanzania (IMPACT). The IMPACT project combines training with mentorship interventions that has been reported to be an important strategy for in-service healthcare workers support for skills and capacity transfer(10), as a result, improve RMNCH outcomes (11). Through the project's baseline survey, we conducted TNA of reproductive, maternal and newborn healthcare workers in Mwanza Region. The IMPACT Project team developed the TNA tool with adaptation of the construct of items from the TNA questionnaire developed by Hicks in 1996 (12). The Hennessy-Hicks TNAQ was developed for evaluating training needs and priorities of the health care professionals and it has been used in both developing and developed countries (12–14). Thus, this study validated the TNAQ in the local Tanzanian context with the goal of facilitating development of effective need-based CPD trainings for improving health care workers' competence in the delivery of RMNCAH services in Mwanza region.

## **Material And Methods**

### **Study Area**

Mwanza region is bordering Lake Victoria located in the northern part of Tanzania. According to the 2012 national census, Mwanza region had a population of 2,772,509 in an area of 35,187 square kilometers (2). For 2002–2012, the average annual population growth rate was 3.0% making Mwanza among eight regions with high growth rate. The Tanzania Human Development Report ranks Mwanza region 13th among the 35 regions of Tanzania, with population living in severe poverty (32.8%) and population vulnerable to poverty (19.7%) as compared to the national average of 31.3% and 18.2% respectively (1).

The region is part of the Lake Zone where the maternal mortality rate was 453 deaths per 100,000 live births and under-five mortality rate was 88 deaths per 1,000 live births in the 10-year period preceding the TDHS 2015/16 and, these rates failed to meet Tanzania's MDG targets (2). The neonatal mortality rate of Mwanza region in 2015 was 29/1,000 live births which remains higher than the national average of 25/1,000 (2).

National data indicates that among pregnant women, only 50.7% attend at least 4 recommended health facility visits for focused ante-natal care (FANC) during the last pregnancy (2). Health facility deliveries in Mwanza region account for 63.6% on average, while large disparities within the region persist with 87% deliveries occurring in facilities in urban areas versus 54.7% in rural areas (2). With the focus on its poor RMNH indicators, Mwanza region is one of five prioritized regions in Tanzania targeted by the Government (2). Understanding the training needs of healthcare workers in Mwanza region forms an important entry point for the IMPACT project in seeking to increase their contribution towards improving RMNH indicators. This created a need for validating the TNAQ in Mwanza

## Design

A cross-sectional survey using self-administered questionnaires was conducted. The survey involved RMNH healthcare workers at selected health facilities in all eight districts of Mwanza Region, Tanzania.

## Sampling and Eligibility

Healthcare workers were selected from 36 sampled health facilities. The healthcare facilities involved all 7 district hospitals, 12 of 51 health centers and 17 of 292 dispensaries. The sample size was determined by the IMPACT Project's need. The sampling of health facilities included in the baseline survey was based a) the number of health facilities included in the project (in total 80), and b) an estimated percentage of facilities considered (based on experiences in other similar surveys) of sufficient power to provide precise measurements for the project indicators at health facility levels. Thus, all district hospitals were included owing to their number, and 63% of health centers and 32% of dispensaries within IMPACT Project were considered sufficient to provide the required study power for the purposes of monitoring and evaluation. The relative homogeneity of dispensaries in terms of infrastructure, service provision, and human resources was also a reason for selecting one-third of the IMPACT Project's target dispensaries.

## Study Population

All adult health workers responsible for RMNH service provision and present in the facility at the time of the survey were eligible to participate. The specific inclusion and exclusion criteria were as follows:

## Inclusion Criteria

1. All health care workers aged 18 years and above
2. RMNH staff present at the facility during the time of the survey
3. Health care workers who can understand and communicate well in Kiswahili or English language
4. Health care workers who were working in RMNH
5. Health care workers who were willing to give informed consent.

## **Exclusion Criteria**

1. Health care workers who were found in RMNH but not usually working in such a unit.
2. Healthcare workers unable to answer questions because of physical or/and mental impediments
3. Healthcare workers not willing to participate.

## **Data collection**

Data collection took place in August 2017. The administered TNA questionnaire was designed for providers of RMNH at the primary (dispensary and health center) and secondary (health center and district and designated district hospital) levels. As noted above, the tool was adapted from the Hennessy-Hicks TNAQ instrument (12, 15), which has been psychometrically tested for reliability and validity and adopted by the WHO (15). The Hennessy-Hicks instrument has been similarly adapted to assess the training needs of different health care practitioners in a range of cultural contexts (12, 15, 16). In the adaptation of the TNAQ, the pooled items were obtained from literature review and expert opinion basing on their experience in the field of reproductive health. These pooled items were validated by the health expert panel with expertise in teaching, reproductive health, research and local culture including customs, traditions and local languages (Kiswahili). The adapted TNA tool divides questions into broad categories, allowing for both intra-category and inter-category comparison of training needs.

During data collection, the person in-charge of the selected facility identified the RMNH personnel to whom the questionnaire was given for completion. Participants were requested to assess their own performance and rate the importance of specific RMNH services/activities through a self-administered, confidential paper-based questionnaire. The questionnaire asked participants how each RNMH related activity is important to the successful performance of their work and how well they considered their performance in each activity with each item in the questionnaire rated along a seven-point Likert scale. Participants were also asked to identify areas in which they most wanted to receive additional training and the trainings that they had most recently completed. Research assistants were on hand to answer questions and clarify elements of the questionnaire. The returned forms were checked for completeness and accuracy before leaving each health facility.

## **Data management, analysis and interpretation**

The Statistical Product and Service Solutions (SPSS, version 20.0) was used for data entry and statistical analysis. Data from the questionnaires were reviewed to identify consistencies and differences, coded and quantified. The data were then manually entered into a password-protected database via an entry screen that performed validation checks for accuracy. The missing data was excluded during analysis.

The TNAQ was validated through a three-phase process: Phase 1 consisted of forward and backward translation of the TNA into Kiswahili by a consultative process involving bilingual (English and Kiswahili) individuals. Phase 2 examined the content validity of TNAQ. Phase 3 involved field testing to implement the exploratory factor analysis (17) and the confirmatory factor analysis (CFA) (Lane et al., 1997; Ford 1997). Analysis of Moment Structures (AMOS) software embedded in SPSS version 20 was used to confirm the factor structure of the TNAQ from the exploratory analysis.

The data collected by TNA were analyzed by comparing the participants' rating scores of the importance of the RMNCAH service/activity (A) with the competence in the service/activity (B) as perceived by them. The greater the difference in scores in TNAQ, the greater the training need.

The Exploratory factor analysis which is a statistical method that helps to identify a set of latent constructs underlying a battery of measured variables (18). In order to make the interpretation of factor analysis, the first step is to extract a set of factors (relevant factors) from a data set, then rotation of the remaining factors (19, 20). Rotation makes the output more comprehensible through formulation of the structure so-called "Simple Structure" (20). Two main types of rotations are used; orthogonal; when the new axis are in orthogonal to each other and oblique; when the new rotations are free to take any space. The promax rotation is an alternative non-orthogonal (oblique) rotation method and it is computationally faster than the direct oblimin method. Therefore it is sometimes used for very large datasets.

The reliability of the TNAQ was assessed. Internal consistency was measured by Cronbach's alpha coefficient with 0.7 indicating acceptance of the instrument. Construct validity was evaluated by EFA and CFA. The EFA was conducted using Principal axis factoring estimation with promax rotation that facilitates the determination of the underlying factor structure of the items and it has advantage of being fast and conceptually simple (21). The factor retention applied the following criteria: (a) eigenvalues greater than 1.0, (b) the percentage of total variance explained, (c) scree plot, and (d) factor loadings above 0.40 were retained. The CFA was determined by using generalized least squares estimation to compare the current and the original 5-factor model of the scale. The model fit was considered acceptable if  $\chi^2/df < 2$ , adjusted goodness-of-fit index (AGFI)  $> 0.9$ , comparative fit index  $> 0.9$ , goodness-of-fit index (GFI)  $> 0.9$ , root mean square error of approximation (RMSEA)  $< 0.04$ , and incremental fit index (IFI)  $> 0.9$  (18, 22).

## Results

A total of 153 healthcare workers participated in this study. The majority of participants were females 8.73% (128) with average age of 39 years. Nurses formed a majority of participants 76% (n = 115) with

relatively similar mean age in service or in RMNH of 7.9 years. The details for sociodemographic data are provided in Table 1.

Table 1  
Demographic characteristics of study participants working in reproductive health in Mwanza (n = 153)

<b>Characteristic</b>	<b>Dispensary (n = 29)</b>	<b>Health Centre (n = 53)</b>	<b>Hospital (n = 70)</b>	<b>Total (n = 152)*</b>
Mean age (years)	37.4	38.0	39.9	38.8
Sex (M, F)	8, 21	8, 45	9, 61	25, 128
Mean years in service	12.9	13.4	14.0	13.59
Mean years in RMNH	8.1	10.1	6.1	7.9
<b>Cadre</b>				
Assistant Medical Officer	1 (3%)	1 (2%)	1 (1%)	3 (2%)
Medical Attendant	8 (28%)	6 (11%)	12 (17%)	26 (17%)
Clinical Officer	0 (0%)	2 (4%)	6 (9%)	8 (5%)
Assistant Nurse Officer	4 (14%)	12 (23%)	13 (19%)	29 (19%)
Enrolled Nurse	6 (21%)	18 (34%)	19 (27%)	43 (28%)
Nurse Midwife	2 (7%)	4 (8%)	4 (6%)	10 (7%)
Nurse Officer	1 (3%)	1 (2%)	5 (7%)	7 (5%)
Registered Nurse	7 (24%)	9 (17%)	10 (14%)	26 (17%)
*One participant had missing demographic data and was excluded for this analysis.				

## Clinical experience

The majority of participants indicated having experience ranging between 0 to 5 years in both general health care services and RMNH. Table 2 offers more details.

Table 2  
Clinical experience among reproductive health care workers in Mwanza region (n = 153)

Number of Years	In service	RMNH
	n (%)	n (%)
0–5	52 (34)	90 (58.8)
6–10	38 (24.8)	33 (21.6)
11–15	11 (7.2)	5 (3.3)
16–20	7 (4.6)	6 (3.9)
21–25	11 (7.2)	6 (3.9)
26–30	13 (8.5)	7 (4.6)
30+	19 (12.4)	7(3.9)
Total	151*	153
*Two participants had incomplete data for in-service.		

## Distribution of training need activity

As shown in Fig. 1, the scores for training need according to the type of health facility was determined. Participants in health centers indicated having highest training needs compared to participants in other healthcare facility levels.

## Reliability of the training need assessment questionnaire (TNAQ)

The exploratory factor analysis produced three factors with eigenvalues of > 1.0 with sampling adequacy of 85%. Those factors were responsible for 36.77% of the variance. The rotation converged in 11 iterations. An examination of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy suggested that the sample was factorable (KMO = 0.85). The Barlett's test of sphericity was significant ( $\chi^2 = 4860.715$ , df 1176,  $p < 0.0001$ ). The details for the factor loadings of TNAQ Items are indicated in Fig. 2.

## Construct Validity Testing

As shown in Table 4 below, the TNAQ retained all the 49 items and displayed three-factor structure. Factor 2 included item number 13 Comprehensive emergency obstetric and newborn care (CEmONC) activities that was named as CEmONC. Factor 3 included item number 29 (surgical care) and 30 (anesthetic care)

and it was named as intra-operative care. All other remaining items formed factor number 1 that was named as general RMNH activities. The sign (positive or negative) indicates the direction that a given variable in the principal component is on a single dimension vector. The smallest value regardless of the sign (+ or -) indicates a small impact.

Table 4

Principal components categorization indicating three factors from study participants (n = 153)

SNO	Items	1	2	3
1	Understanding gender equality issues relating to reproductive, maternal, child and adolescent health	.557	-.135	.107
2	Delivering gender sensitive reproductive, maternal, child and adolescent health services (such as providing privacy for consultations, gender sensitive counselling approaches, involvement of men)	.505	-.233	-.183
3	Providing client/patient friendly reproductive, maternal, child and adolescent health services	.607	-.319	-.103
4	Understanding and using maternal, newborn and child health (MNCH) score cards (1)	.621	-.267	-.272
5	Providing focused antenatal care (FANC) according to WHO guidelines	.652	-.188	-.239
6	Offering malaria diagnosis with rapid diagnostic testing (RDT)	.512	-.284	-.285
7	Providing malaria treatment in pregnancy	.557	-.307	-.141
8	Providing education and counselling around voluntary counselling and testing (VCT) for HIV/AIDS	.605	-.325	-.297
9	Providing education, counselling and support around HIV/AIDS prevention, care, and management for adolescents	.491	-.051	-.335
10	Competently managing uncomplicated deliveries	.552	.243	-.442
11	Competently utilising the partograph for every women in labour	.626	.444	-.443
12	Competently providing basic emergency obstetric and newborn care (BEmONC) including: <ul style="list-style-type: none"> <li>o Parenteral antibiotics</li> <li>o Parenteral uterotonic drugs</li> <li>o Parenteral anticonvulsants</li> <li>o Manual removal of retained placenta</li> <li>o Removal of retained products of conception</li> <li>o Instrumental vaginal delivery</li> <li>Basic neonatal resuscitation</li> </ul>	.508	.426	.101

SNO	Items	1	2	3
13	Competently providing comprehensive emergency obstetric and newborn care (CEmONC) o All BEmOC signal functions plus o Surgery o Blood transfusion	.448	.467	.127
14	Competently managing severe intra- and postpartum haemorrhage	.687	.498	-.170
15	Responding effectively to women suffering from severe pre-eclampsia and eclampsia	.612	.514	-.410
16	Effectively resuscitating new-borns using the new-born bag and mask (HBB-Helping Babies Breathe)	.681	.421	-.402
17	Identifying dangerous signs and complications in child birth and effectively managing maternal and new-born referral for further investigations or treatment	.631	.298	-.401
18	Providing education and counselling on prevention of mother to child transmission of HIV (PMTCT)	.765	-.197	-.175
19	Effectively managing PMTCT treatment of HIV positive pregnant women, mothers and infants	.637	-.154	-.187
20	Providing education, counselling and support to mothers in early initiation of breast feeding (within one hour of delivery) and exclusive breast feeding for 6 months	.650	-.184	-.297
21	Implementing the maternal infant and young child nutrition (MIYCN) programme	.681	.050	.102
22	Offering the Tanzania expanded programme for immunization (EPI)	.600	-.181	-.052
23	Understanding vaccine management and logistics (cold chain maintenance)	.668	-.209	.048
24	Being proficient on injection safety and infectious waste management	.777	-.237	-.035
25	Providing family planning services to women and men in a union	.770	.082	-.172
26	Providing family planning services to unmarried/single women and men	.675	-.140	.071
27	Providing information, education, counselling or family planning services to adolescents	.602	-.151	.022
28	Providing care and education for cervical cancer screening and treatment	.617	.336	.165
29	Feeling confident in providing surgical care (including caesarean section)	.320	.268	.533

SNO	Items	1	2	3
30	Feeling confident in providing anaesthetic care	.312	.296	.572
31	Identifying cases of sexual and gender based violence and knowing how to make appropriate referrals	.671	.322	.264
32	Providing counselling, care and support for women who are subject to gender based violence	.721	.190	.130
33	Planning and organizing an individual patient's care	.653	.212	.267
34	Evaluating patients' psychological and social needs	.504	.385	.383
35	Implementing effective infection control strategies	.712	.387	.185
36	Implementing effective disease surveillance and reporting	.639	.269	.331
37	Organising your own time effectively	.623	-.005	-.018
38	Personally coping with change in the health service delivery	.721	-.106	.020
39	Working as a member of a team	.660	-.052	.150
40	Assuming a leadership role	.435	-.284	.258
41	Developing leadership skills	.503	-.156	.327
42	Mentoring and guiding other staff	.758	-.147	.095
43	Supervision and management of community health workers	.487	-.353	.268
44	Training of community health workers	.514	-.128	.166
45	Undertaking effective data reporting and monitoring of service delivery	.500	-.259	.269
46	Statistically analysing your own data and using health facility data to understand local health challenges and inform service delivery	.635	-.249	.184
47	Identifying research needs and designing locally relevant research	.470	-.226	.303
48	Accessing research resources (e.g. time, money, Information, equipment)	.450	-.175	.341
49	Actively influencing evidence based services provision	.672	-.366	.188

## Confirmatory Factor Analysis (CFA) for TNAQ

The CFA was performed using generalized least squares estimation to compare the current and the original 3-factor model of the scale. A model was found to be good ( $X^2/df < 3$ ) and Comparative fit index (CFI) was found to be at the best level (CFI = 1). However, the RMSEA was 0.185 indicating that it was bad as a smaller values indicate better model fit. Overall, the unsuitable index was ignored because other two

indices were suitable, are commonly used and are more predictive. The summary of indices and its related threshold for interpretation are summarized in Table 5.

Table 5  
The measure for confirmability factor analysis indicated the model suitability for the Training need assessment questionnaire.

Indices	Measure observed	Threshold
CFI	1	> .95best, > .90 traditional, > .80 permissible
X <sup>2</sup> (CMIN/DF)	0.000	< 3 Good,<5 permissible
RMSEA	0.185	< .05good, .05-.10 moderate; >.10bad

## Discussion

The aim of this study was to validate the TNAQ in RMNH services within Mwanza Region, Tanzania. The TNAQ was adapted from Hennessy-Hicks instrument (12), which has been psychometrically tested for reliability and validity and adopted by the WHO (12, 15). The Hennessy-Hicks instrument has been similarly adapted to assess the training needs of different health care practitioners in a range of cultural contexts for instance it has been used in Indonesia (13) and in the UK (14–16). Recently, in low income countries there is a higher demand for continuous development programs (23) that are not necessarily focusing on the actual professional knowledge and skills needs in the local health care settings (24). Therefore, TNAQ tool that is scientifically validated has a potential to provide a baseline for identification of training needs for RMNH primary health care workers in low income countries.

In this study, the reliability of the adapted TNAQ was tested and found to be 0.954. Relatedly, indexes for construct validity indicated that CFI was equal to 1 (CMIN/DF) was 0.000 and RMSEA of 0.185 was reported. These indices are within the acceptable threshold indicating excellent reliability and validity of the instrument. This suggests that the TNAQ is excellent tool for assessing the training needs on RMNH in Tanzanian context. The majority of Tanzanians are likely to share the culture such Kiswahili language is spoken by about 95% of Tanzanians. Moreover, expression of culture and training needs may reflect other low-income countries as the need and cultural background (10). A number of studies from different context and cultural background have reported similar psychometric properties (16, 25, 26). Therefore, the findings of this study suggest that the modified TNAQ that took into account the Tanzanian national guidelines on RMNH care, participants' culture including Kiswahili have acceptable reliability, design and content validity.

The exploratory factor analysis of training needs revealed the shared variance of three factors. This study finding is similar with another on translation and validation of Hennessy-Hicks - tool in Greek (27) that found the overall internal consistence of 0.98 (16). Furthermore, although reliability is important for the study, for a test to be reliable, it also needs to be valid (19, 20). The internal consistence coefficient of 0.7 is agreeable by many scholars as a minimum (28, 29). For exploratory or pilot study, the reliability

coefficient 0.60 or above is acceptable (17). The four categories of cut-off points for reliability have been suggested such as excellent reliability equals to 0.90 and above, high reliability (0.70–0.90), moderate reliability (0.50–0.70) and low reliability (0.50 and below) (30). Thus, the finding of internal consistence coefficient of 0.954 in the present study indicates excellent reliability of the TNA tool.

In the development of the TNAQ, the pooled items were obtained from literature review and expert opinion basing on their experience in the field of reproductive health. The pooled items were then validated by the health expert panel with expertise in teaching, reproductive health, research and local culture including customs, traditions and local languages (Kiswahili). This provided the strength for face and content validity. The construct validity was determined by exploratory factor analysis (17) and confirmatory factor analysis (CFA). The EFA yielded a three-factor model that was explained by 36.77% of variance. This is different from the original TNAQ that was having five categories including research/audit, communication/teamwork, administrative/technical, management/supervisory and clinical (12). The difference might be resulting from the focus of the tools where the current TNAQ focused on RMNH while the original TNAQ focused on identifying general health care workers' training needs.

The EFA derived structure was validated by CFA. Although RMSEA were insignificant, but majority of for CFA indices indicated the acceptable fit of the model. The RMSEA has been found to be sample dependent and over-rejecting at small sample size. Thus, Kenny (31) suggested that the RMSEA should not be computed for small df models as too often falsely indicates a poor fitting model but rather estimating parameters that were not originally specified in the model. Moreover, although there are several types of validity, construct validity is regarded as the most important form of validity and forms the basis for any other type of validity and is scientifically viewed as the whole of validity (32). In this study the construct validity was at acceptable level.

Training need assessment is an initial step of a cyclical process contributing to an overall strategy of training and education (33). Training interventions are developed to meet the identified needs. Meeting the training needs is certainly in the current Government Policy in Tanzania (34). Thus, the validated instrument with good psychometric properties will be helpful in analyzing the training needs and priorities of the health care workers.

The limitation of this study is fourfold. First, the study was a cross-sectional that provides only a snapshot in-time. However, the reliability and validity of competence include behavior and attitudes in health care industry can better be measured by a continuum-over-time basis (35, 36). Future studies that provide test-retest reliability and validity over-time are warranted to validate the findings from this study. Second, there was a disproportionate number of items across the identified factors. Future studies should try to reduce the size of the instrument to keep it practical while maintaining the factor structure and its psychometric properties. Third, some participants clearly misinterpreted some questions. For instance, the majority of dispensary workers listed CEmONC as important to their work, but according to the national guidelines dispensaries do not provide CEmONC. Finally, some participants did not respond to the full range of the scale. Therefore, efforts should be made to recruit targeted participants that match

with the measured level of competence. However, those limitations did not affect the reliability and reliability of the study as the missing data was excluded in the analysis.

In conclusion, the adapted TNAQ appear to be reliable and valid for identifying professional needs for health care workers in RMNH at all levels of health care settings in Mwanza region. The tool has a considerable level of psychometric properties that makes it suitable for assessing the training needs among health care workers of different cadres and from various health care settings. However, the applicability of the TNAQ in the wider health care systems remains unclear. Future studies with a large sample size are required to test the use of TNAQ in wider health care systems and learning opportunities.

## List Of Abbreviations

BEmONC: Basic emergency obstetric and newborn care; CEmONC: Comprehensive emergency obstetric and newborn care; CPD: Continuous Professional development; IMPACT: Improving access to reproductive, maternal and newborn health in Tanzania; TNAQ: Training Need Assessment Questionnaire; RMNH: Reproductive, maternal, newborn, health; MMR: Maternal mortality rate; NIMR: National Institute for Medical Research; SDG: TDHS: Tanzania demographic health survey; MOHCDGEC: Ministry of Health, Community Development, Gender, Elderly and Children; WHO: World health organization

## Declarations

## Ethics approval and consent to participate

The approval for conducting this baseline survey was obtained from National Institute for Medical Research in Tanzania (Registration Certificate: NIMR/HQR/R.8a/Vol.IX/2517) after a review from the Aga Khan University Institutional Review Board in Tanzania. The permission to conduct the study was obtained from the Mwanza Regional Administrative Secretary. All participants provided oral and written informed consent after explanation of the benefit, potential harm, duration of the interview and the right to refuse or withdrawal from the study at any point when they feel to do so.

## Consent for publication

Not applicable

## Availability of data and materials

The data that support the findings of this study are available from Aga Khan University Monitoring and Evaluation Research Unit (MERL). There are some restrictions to the availability of these data due to license, so the data are not publicly available. However, the data may be made available from the authors

upon reasonable request and with permission of the Aga Khan University Monitoring and Evaluation Research Unit (MERL).

## Competing interests

Authors declare that they have no competing interests

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## Authors' contributions

TM drafted the manuscript and conducted data analysis. GE, SB, and KI reviewed the original TNAQ. TM, MM, JO, and DS conducted the data collection. SB, DS, ES, MM, CM, LM, TM, KI and MT contributed to the conception, and design of the study. TM, CM, KI, LM, EP, GE, JO, MM, MM2, LS, SM, DS, ES, MT, and SB provided critically important revisions of the manuscript. All authors read and approved the final manuscript.

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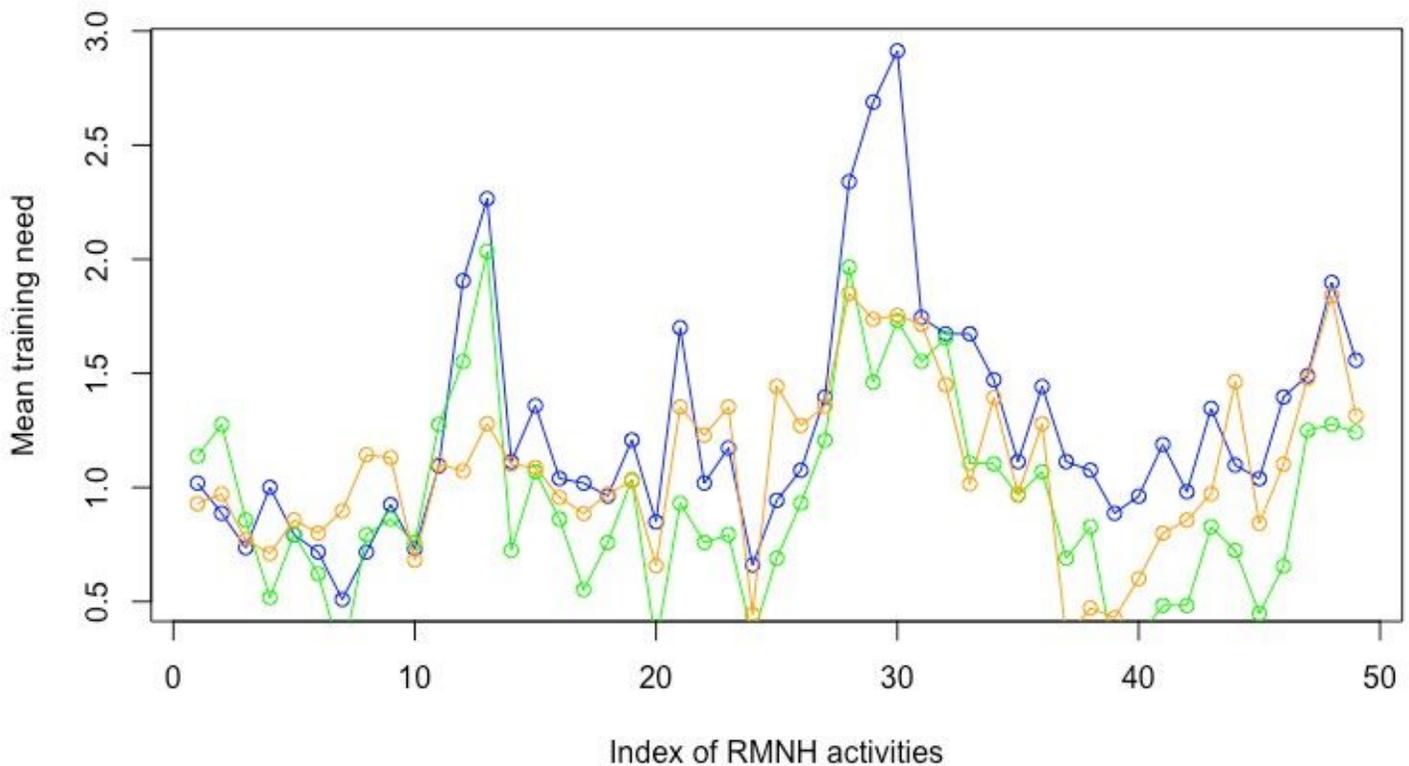
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## Figures



**Figure 1**

Mean training need for each RMNH activity, by type of facility \*green = dispensary; blue = health center; orange = hospital

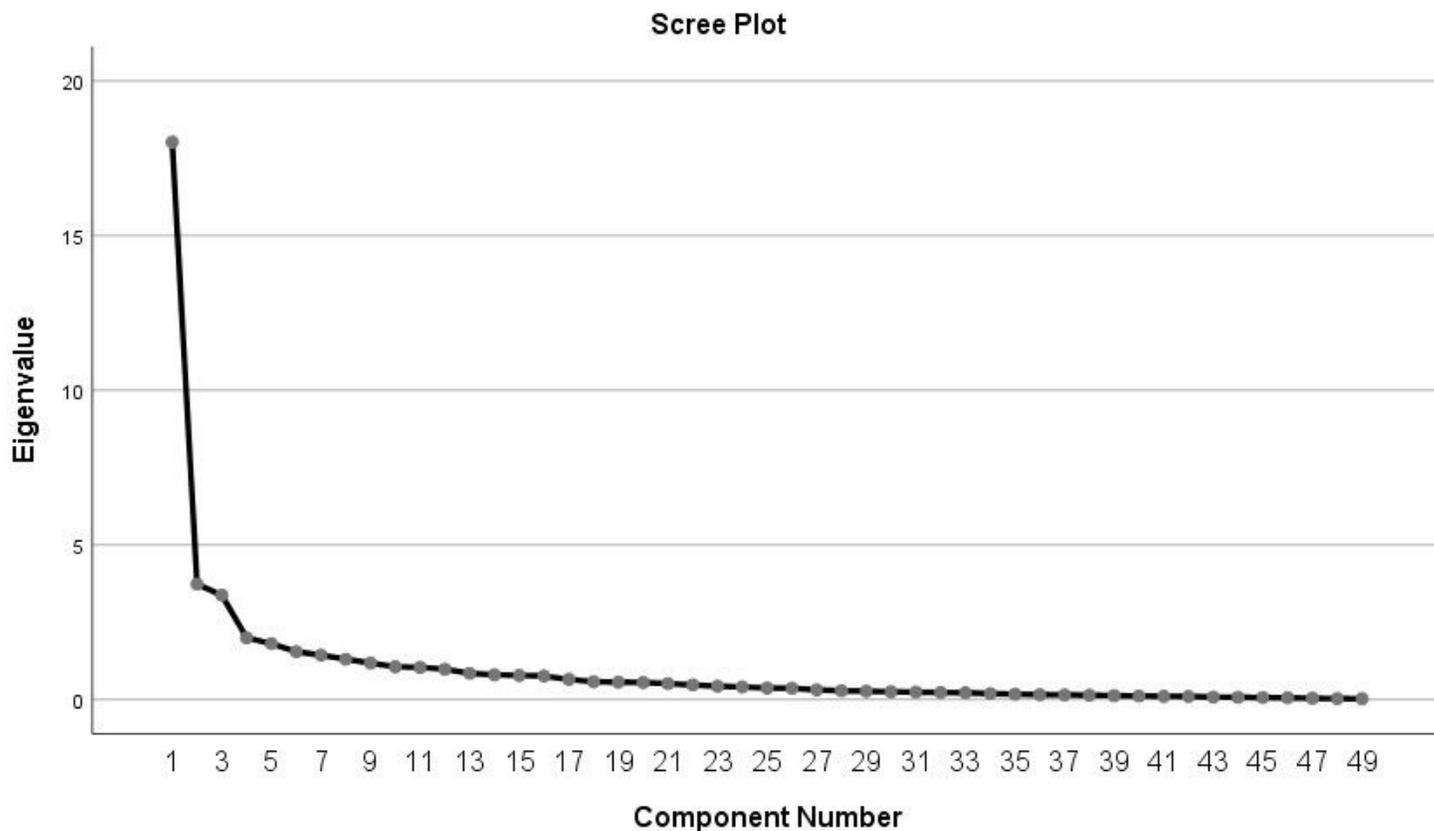


Figure 2

Scree plot with Eigenvalues to indicate the distribution of Principal components