



Validation of Tamil Version of the Anemia Knowledge Questionnaire (AKQ)

Aruna Subramaniam^{*1}, Sirala Nalini Jagadeesh², Poongodi Ramalingam¹, Saranya P³

¹Department of Community Health Nursing, Faculty of Nursing, Sri Ramachandra Institute of Higher Education & Research (DU), Chennai-600116, Tamil Nadu, India

²Faculty of Nursing, Sri Ramachandra Institute of Higher Education & Research (DU), Chennai-600116, Tamil Nadu, India

³Department of Obstetrical & Gynecological Nursing, Faculty of Nursing, Sri Ramachandra Institute of Higher Education & Research (DU), Chennai-600116, Tamil Nadu, India

Article History:

Received on: 25 Aug 2020

Revised on: 26 Sep 2020

Accepted on: 28 Sep 2020

Keywords:

Anemia,
Knowledge,
Scale,
Validity,
Reliability

ABSTRACT



In India anemia is a common problem among Antenatal Women. In order to decrease maternal mortality, it is important to create knowledge among antenatal women. Varied instruments have been used to assess knowledge on anemia. However, there is a shortage for validated instruments in India for assessing anemia knowledge. The aim of present study is to develop a reliable and valid questionnaire to assess the knowledge of anemia to be used in antenatal women, reproductive women and adolescent girls. Before pretest researchers measured face validity and construct validity. The study was conducted in antenatal outpatient department of selected primary health centers at Thriuvallur district, Tamil Nadu, India. Subjects: Six nursing and one psychology expert, ten Village Health Nurse (VHN) and 100 antenatal mothers participated in the mission. During factorial analysis *sampling* adequacy was measured by using Kaiser-Meyer-Olkin (KMO) test (MSA) = 0.87 and Bartlett's test of sphericity was $X^2 = 458.338$ ($p < 0.001$). Varimax with Kaiser normalization rotation was performed and three factors were defined. The "general awareness" consists of four items ($\alpha = 0.79$), anemia investigation and treatment component consists of six items ($\alpha = 0.81$) and under diet and complication of anemia component, there is a five item factor ($\alpha = 0.89$). In individual questions factor analysis, Cronbach's alphas ranged from .84 and .86. 15.2% indicating total variance. There is no statistical significance between test and retest method. The questionnaire showed good validity and reliability (internal consistency and reproducibility), hence we can use this questionnaire among adults.

*Corresponding Author

Name: Aruna Subramaniam

Phone: 9444412607

Email: aruna@sriramachandra.edu.in

ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v11iSPL4.3893>

Production and Hosted by

IJRPS | www.ijrps.com

© 2020 | All rights reserved.

INTRODUCTION

The continuous rise in anemia is presently a huge global health concern, especially in developing countries like India. Anemia causes serious health problems and it is the second most important cause of disability worldwide (World Health Organization, 2014). Nearly 50% of antenatal mothers has been affected by anemia in developing countries. In developing countries anemia is a major cause of morbidity and mortality among pregnant women and it leads to maternal and fetal complica-

tion (Khaskheli *et al.*, 2016; New and Wirth, 2015). Globally, more than 115,000 maternal and 591,000 prenatal deaths per year were due to anemia (Asrie, 2017). 54% of rural women and 46% of urban women were anemic in India according to National Family Health Survey - 2 (IIPS & ICF, 2018). Nearly half of the (57%) women has moderate level of anemia and 12 to 13% of them has mild, and severe anemia respectively in India (ICMR, 2004).

Maternal and fetal well-being are adversely affected during pregnancy as a result of anemia, and it leads to fetal death and morbidity. Breathing difficulties, fainting, tiredness, palpitations, and sleep difficulties were some symptoms frequently experienced by affected mothers (Canobbio *et al.*, 2017; Lee *et al.*, 2001). Perinatal infection, pre-eclampsia, bleeding, post-partum cognitive impairment and behavioral difficulties incidence have also increased (Wang *et al.*, 2018; Figueiredo *et al.*, 2018). Particularly in the developing world, mortality risks have significantly increased because of the adverse perinatal outcomes including intrauterine growth retardation, prematurity, and low birth weight (Bangal *et al.*, 2016; Sharma *et al.*, 2016). More negative impact on fetal growth is noticed due to anemia that developed during the third trimester than in the cases where anemia developed during the first and second trimester (Tabrizi and Barjasteh, 2015; Kumar *et al.*, 2013).

Health promotion based proposal are emerging as a result of increase in chronic diseases like anemia in the last 25 years. Health promotion concept was thoroughly discussed and challenging scientific community to control chronic diseases. Adequate skills and knowledge is required to solve the problem of anemia and to improve their behavior on anemia control. Effective prevention and treatment will not be ensured by skills and knowledge. Understanding antenatal mother's knowledge regarding anemia is supportive in clinical settings and research practice to evaluate teaching and to implement individualized education (World Health Organization, 2016).

Educational interventions meant to increase the knowledge of patients with chronic diseases can in turn will help to control, prevent and decrease the number of hospitalizations. Nevertheless, a recently published interventional study among pregnant women shows that Single educational interventional training for 45 minutes increased baseline knowledge regarding causes, signs and symptoms of anemia and dietary sources of iron from 21%, 23% and 40% to 64%, 66% and 72% respectively after the intervention (Nimbalkar *et al.*, 2017). Self-care

stimulus is emphasized to prevent anemia in antenatal women, reproductive women and adolescent girls. For this purpose, it is required to construct questionnaire that is simple and relevant to women, which will be aimed at verifying the knowledge they have regarding anemia.

In India, many studies have been executed to assess the knowledge related to anemia (Kumary *et al.*, 2014; Priyankakumarai and Amoldeep, 2018). Knowledge barriers are the main reason for poor compliance of iron and folic acid (IFA) tablets uptake. Several studies Kimiywe *et al.* (2017); Rai *et al.* (2016) reported that during IFA tablets distribution, women did not receive adequate information. Qualitative study regarding anemia carried out in India Chatterjee and Fernandes (2014) showed that pregnant women were ignorant about the consequence of anemia on maternal outcomes. In most of the study, knowledge was assessed using not psychometrically validated questionnaire. For the Tamil population there are no valid and reliable instruments. Use of validated instrument can provide sound scientific conclusions from its results. To make sure that assessment questionnaire is valid and reliable appropriate psychometric methodology need to be followed. Taking into consideration these information, this study has been designed to develop reliable and valid questionnaire to assess the knowledge of anemia to be used in antenatal women, reproductive women and adolescents girls.

METHODS

Tool design

The questionnaire was developed in five stages: literature review, selection of variables, expert evaluation, pilot study, and evaluation of psychometric properties. Questionnaire was constructed based on the extensive review of literature on anemia knowledge, prevention and management (Sivapriya and Parida, 2015; Angadi and Ranjitha, 2016). The questionnaire was developed involving four health care professionals (An obstetrician, a nurse, and two nurse educators).

To assess the relevant application of the items, the language, the measurement scales used and to offer valuable suggestions for the inclusion of other items, the first version of questionnaire was sent to four experts in the areas of nursing and nursing education who have extensive experience in maternal and child health, medical surgical nursing and community health nursing. Pilot study was performed consequently with 30 antenatal women. All antenatal women were from a selected primary health centre at Thiruvallur district who did not participate

in the final study. The questionnaire was administered through self structured interview and self administered method, in order to establish the best method for performing the data collection. While administering questionnaire antenatal women were told to clarify their doubts and difficulty in understanding the questions with the researcher. The researcher noted down the questions which the subjects found difficult to understand and possible corrections were carried out.

The AKQ was developed for this study by the researcher to measure the antenatal women's knowledge regarding general awareness about anemia (4 items), investigation and treatment (6 items), prevention and complication (5 items) of iron deficiency anemia. It consists of structured interview schedule and has 15 multiple choice questions. All questions were with four options of which one was the correct option. Score one was given for every right answer and score zero was given to every wrong answer. The distribution followed the pattern: General awareness about anemia score (4), Investigation and treatment score (6), and Prevention, control and complication score (5). Total possible score was 15.

Four experts rated the questionnaire in three point rating scale as not necessary (0), useful (1), essential (2). All comments were scored to calculate content validity ratio (CVR) and content validity index (CVI) using the following formula (Lawshe, 1975).

To calculate the CVR (a score for individual scale item)

$$CVR = \frac{ne - N/2}{N/2}$$

Note:

ne = The number of experts who rated an item as essential.

N= the total number of experts.

The CVI is the mean CVR for all retained items.

CVI was calculated from the average score of the four experts, thus CVI of the AKQ was 0.978. The stability reliability of the tool was established by test-retest method at two weeks for 30 samples and the calculated correlation coefficient was 0.91. The equivalence reliability of the tool was established and the Cornbach's alpha coefficient for this sample was 0.80.

The data collection period was February 2018 to June 2018. Approval to conduct the study was obtained from the Sri Ramachandra Medical College and Research Institute (Deemed University) institutional ethics committee for student project under

REF:CSP/18/JAN/66/37. The study was conducted in antenatal outpatient department of Nemam and Sorancherry primary health centres at Thriuvallur district. Nemam and Sorancherry primary health centres are situated in the Poonamallee- Thiruvallur road at a distance of about 17 km away from Sri Ramachandra Medical College and Research Institute deemed to be university, Porur, Chennai, India.

Statistical Analysis

SPSS version 19.0 for Windows was used for the data examination. Means and standard deviations were used to explain the continuous variable. To find out the internal consistency of the tool Cronbach's alpha coefficient (α) was used; values > 0.7 were considered as valid. To confirm reproducibility, test and re-test method was used and intra-class correlation coefficient (ICC) was performed with acceptable values close to 1. Reliability values > 0.2 (25) were considered as acceptable while calculating the item-total correlation test. To validate the tool, following test were computed. To find out the number of factors to be extracted, Load factor analysis was completed, load values ≥ 0.3 were used as standard parameters. To determine sphericity index, Bartlett's test was rundown with a significance level $p < 0.05$. Adequacy of sampling was measured with the help of the measures of sampling adequacy (MSA) of Kaiser-Meyer-Olkin (KMO), ≥ 0.60 MSA values were considered as satisfactory. Lastly, number of factors was extracted by scree plot analysis.

RESULTS

A total of 100 antenatal women's were conveniently selected for the study. Average age of the participants was 25.6 years, the minimum age of the participants was 18 years and maximum age of the participants was 35 years. 45.0% of antenatal women was in the age group of 21-25 years and 30.0% of them were in the age group of 26-30 years. Majority (70%) of them were educated up to higher secondary education. Most of the antenatal women 86 (86.0%) were housewives. 28% of them had Hemoglobin levels less than 10 g/dl. Almost 52% of them had Hemoglobin levels 10-12 g/dl, while only 5% of them had Hemoglobin levels above 12 g/dl. Each participant was interviewed separately and privately while being made to sit comfortably in chair. The interview lasted for 30 to 40 minutes. Strict confidentiality was maintained throughout the interview, the language used for the interview was Tamil. Distribution of antenatal women according to their demographic and maternal variables is shown in Table 1 Factor Analysis.

Table 1: Distribution of the study group according to Demographic and maternal variables

Maternal variables	%
Age in years	
18-20	11.0
21-25	45.0
26-30	30.0
31-35	14.0
Type of Family	
Nuclear family	35.0
Joint family	65.0
Hemoglobin level after completion of 32 weeks of gestation	
Not done	15.0
< 8g/dl	6.0
8.1-9.9 g/dl	22.0
10-12 g/dl	52.0
12.1-15 g/dl	5.0
Number of pregnancy	
One	44.0
Two	39.0
Three	9.0
More than three	8.0
Gestational age in trimester	
First trimester	15.0
Second trimester	34.0
Third trimester	51.0
During present pregnancy have a history of	
N/A	79.0
Pregnancy induced hypertension	2.0
Gestational diabetes	4.0
Ante partum hemorrhage	1.0
Twin pregnancy	1.0
Hyper emesis gravidarm	14.0

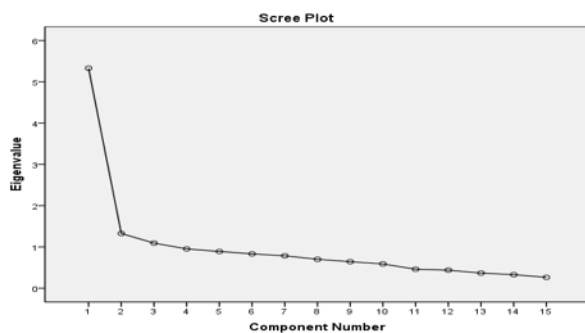


Figure 1: Scree plot for AKQ:construct validity

Factor analysis, particularly principal component analysis was performed to assess construct validity in order to establish the credentials deliberated by the questionnaire and observe the significance of the total scores. Kaiser-Meyer-Olkin measure of sampling adequacy was .873 and Bartlett’s test of sphericity, approx. Chi-Square was 458.338 with p

< 0.001. Factor loading of <0.40 (total: 5 items) in the factor analysis were excluded from individual item and sub-scale items. Three factors were extracted from varimax rotation. The AKQ 15 questions appear to determine 3 primary factors since only these 3 primary factors have an Eigenvalue of at least 1(Scree plot) as shown in Figure 1. The distribution followed as six items in first factor, 5 items in the second factor and 4 items in the third factor. Total variance accounted for each factor was 35.5%. All the items had unrotated factor loading more than .4. The total variance of three factors was 52%. The final questionnaire consisted of three dimensions considering the factor analysis, one as general aspect, second dimension as identification and treatment and third dimension including prevention and complication aspects. The Table 2 shows the results of the factor analysis for AKQ.

The reliability of the scale and each sub-dimension

Table 2: Results of the factor analysis for AKQ

Sub-dimensions Item number	Item	Factor loading	Variation explained (%)
General awareness about anaemia	1.What is anemia in pregnancy?	.829	35.530
	2.What is the most common cause of anemia?	.719	
	3.Which of the following affects the pregnant women at a higher risk of acquiring anemia?	.563	
	4.Which of these are signs of anemia?	.736	
	5.What is the normal hemoglobin level during pregnancy?	.792	
Treatment	6.How long should the patient take treatment for the cure of anemia?	.894	8.841
	7.What is the first line treatment of anemia?	.804	
	8.What will be the treatment for severe anemia?	.673	
Diet and complication	9.What type of diet is ideal for anemia?	.700	7.286
	10.Which of the following is rich in iron?	.800	
	11.Which of the following is rich in Vitamin C?	.853	
	12.Which element hinders the iron absorption?	.821	
	13.Which element enhances the iron absorption?	.670	
	14.What is the maternal complication of severe anemia during pregnancy?	.795	
	15.What is the fetal complication of severe anemia in a mother?	.875	

was calculated using the Cronbach alpha coefficient. During the analysis the Items that had an item-total correlation of <0.40 were reframed and included in the measure. For every item, a Cronbach coefficient alpha value of >0.69 and <0.95 was defined as acceptable. Ultimately, no items were excluded from the scale.

The internal consistency of the complete scale Cronbach alpha values was 0.93, the sub scale General awareness about anemia scale value was 0.79, Treatment value was 0.81 and Diet and complication value was 0.89. According to [George and Mallery \(2003\)](#) rules reliability of the complete scale was excellent, while the sub scale reliability were good and acceptable.

DISCUSSION

To the best of our acquaintance, this is the first study in India with regard to development and validation of an anemia knowledge questionnaire. This study helped to develop reliable and valid questionnaire consisting of 15 items for assessment of knowledge on anemia among women of reproductive age (WRA). The early and ultimate appraisal of the questionnaire showed excellent content validity and test-retest reliability among the Tamil speaking popula-

tion.

Globally 41.8% of pregnant women was affected by anemia. Among the 16MM (16 major pharmaceutical markets) India has the highest prevalence of anemia. The prevalence is even higher among Indian women, with around 50% of women having low hemoglobin levels. The major apprehension about the undesirable effects of anemia on pregnant women is the faith that this group is at higher risk of perinatal mortality and morbidity ([Global-data, 2017; de Benoist et al., 2008](#)).

According to National Family Health Survey 3 only 23% of pregnant women has consumed Iron and folic acid tablets during their pregnancy for at least 90 days though the Iron and folic acid treatment to pregnant women was good. Insufficient awareness concerning anemia and iron rich food, avoidance of iron supplements due to misconceptions, pessimistic attitudes towards antenatal visits, importance of a healthy diet, and iron and folic acid intake during pregnancy are the main causes for the negative impact and low compliance among pregnant women. Hence the present study was carried out to construct a questionnaire that perfectly reflects culturally reliable social norms values and viewpoints in an attempt to determine individual knowledge

levels.

Anemia knowledge questionnaire was developed with 15 items for the assessment of the antenatal women's level of knowledge and it was standardized to use among antenatal women with anemia and without anemia, adolescents and woman of reproductive age. Standardization was done both in English and local Tamil language. AKQ can be utilized as a screening tool to assess the knowledge and to plan, implement and evaluate the educational interventions to improve the knowledge of the reproductive age women before pregnancy, during pregnancy and after pregnancy thereby enabling them to be active participants in the maintenance of healthy reproductive period. Antenatal women's knowledge regarding general awareness about anemia, investigation and treatment, prevention and complication of iron deficiency anemia, these three domains of the questionnaire analysis in detail thereby the comprehensive knowledge essential to empower women's passionate involvement in disease management can be evaluated by the questionnaire.

CONCLUSION

The prevalence of anemia is still peaking in developing countries like India. Studies in such environments show us that the relation between health seeking behavior and knowledge is not adequately addressed. The questionnaire newly developed and validated through this study serves twin purposes namely assessing knowledge regarding anemia and educating the vulnerable in a way developing health seeking behavior as part of the anemia prevention and control program.

ACKNOWLEDGEMENT

None.

Funding Support

The authors declare that they have no funding support for this study.

Conflict of Interest

The authors declare that there is no conflict of interest for this study.

REFERENCES

Angadi, N., Ranjitha, A. 2016. Knowledge, attitude, and practice about anemia among adolescent girls in urban slums of Davangere City, Karnataka. *International Journal of Medical Science and Public Health*, 5(3):416-416.

Asrie, F. 2017. Prevalence of anemia and its associated factors among pregnant women receiving antenatal care at Aymiba Health Center, northwest Ethiopia. *Journal of Blood Medicine*, Volume 8:35-40.

Bangal, V. B., Aher, K., Bhosale, K., Tuse, H. 2016. Study of Maternal and Perinatal outcome in moderate to severe degree iron deficiency anaemia in rural community. *International Journal of Biomedical and Advance Research*, 7(2):88.

Canobbio, M. M., Warnes, C. A., Aboulhosn, J., Connolly, H. M., Khanna, A., Koos, B. J., Mital, S., Rose, C., Silversides, C., Stout, K. 2017. Management of Pregnancy in Patients With Complex Congenital Heart Disease: A Scientific Statement for Healthcare Professionals From the American Heart Association. *Circulation*, 135(8):50-87.

Chatterjee, N., Fernandes, G. 2014. 'This is normal during pregnancy': A qualitative study of anaemia-related perceptions and practices among pregnant women in Mumbai, India. *Midwifery*, 30(3):e56-e63.

de Benoist, B., et al. 2008. Worldwide prevalence of anaemia 1993-2005. WHO Global Database on Anaemia, ISBN: 9789241596657.

Figueiredo, A., Gomes-Filho, I., Silva, R., Pereira, P., Mata, F., Lyrio, A., Souza, E., Cruz, S., Pereira, M. 2018. Maternal Anemia and Low Birth Weight: A Systematic Review and Meta-Analysis. *Nutrients*, 10(5):601.

George, D., Mallery, P. 2003. SPSS for Windows step by step: A simple guide and reference. 11.0 update (4th ed.). Boston: Allyn & Bacon, ISBN: 9780205375523.

Globaldata 2017. EpiCast Report: Chronic Kidney Disease - Epidemiology Forecast to 2026. GDHCER175-17, Accessed on: 25 Apr 2020.

ICMR 2004. Micronutrient Profile of Indian Population. Indian Council of Medical Research, New Delhi. Accessed on: 25 Apr 2020.

IIPS & ICF 2018. National Family Health Survey (NFHS-4), India, 2015-16. International Institute for Population Sciences (IIPS) and ICF. National Family Health Survey (NFHS-4), Accessed on: 25 Apr 2020.

Khaskheli, M., Baloch, S., Baloch, A. S., Baloch, S., Khaskheli, F. K. 2016. Iron deficiency anaemia is still a major killer of pregnant women. *Pakistan Journal of Medical Sciences*, 32(3):630-634.

Kimiywe, J., Ahoya, B., Kavle, J., et al. 2017. Barriers to Maternal Iron_Folic Acid Supplementation & Compliance in Kisumu and Migori, Kenya. pages 1-16. USAID.

- Kumar, K. J., Asha, N., et al. 2013. Maternal Anemia in Various Trimesters and its Effect on Newborn Weight and Maturity: An Observational Study. *Int J Prev Med*, 4(2):193-199.
- Kumary, T. V., Baby, A., Venugopal, J., D'silva, R., Chacko, S., Vineesha, P. V. 2014. Knowledge on management of anemia during pregnancy: A descriptive study. *Archives of Medicine and Health Sciences*, 2(2):140-144.
- Lawshe, C. H. 1975. A Quantitative Approach to Content Validity. *Personnel Psychology*, 28(4):563-575.
- Lee, K. A., Zaffke, M. E., Baratte-Beebe, K. 2001. Restless Legs Syndrome and Sleep Disturbance during Pregnancy: The Role of Folate and Iron. *Journal of Women's Health & Gender-Based Medicine*, 10(4):335-341.
- New, S., Wirth, M. 2015. Anaemia, pregnancy, and maternal mortality: the problem with globally standardised haemoglobin cutoffs. *BJOG: An International Journal of Obstetrics & Gynaecology*, 122(2):166-169.
- Nimbalkar, P. B., Patel, J. N., Thakor, N., Patni, M. 2017. Impact of educational intervention regarding anaemia and its preventive measures among pregnant women: an interventional study. *International Journal of Reproduction, Contraception, Obstetrics and Gynecology*, 6(12):5317-5321.
- Priyankakumarai, N., Amoldeep 2018. Prevalence of anemia and knowledge of risk factors about anemia in pregnant women: a study at primary health centers in rural areas of north India. *European Journal of Biomedical and Pharmaceutical Sciences*, 5(1):275-279.
- Rai, S. S., Ratanasiri, T., Arkaravichien, T. 2016. Compliance and its Determinants Regarding Iron and Folic Acid Supplementation during Pregnancy in Kathmandu, Nepal. *Kathmandu Univ Med J*, 14(56):311-317.
- Sharma, D., Shastri, S., Sharma, P. 2016. Intrauterine Growth Restriction: Antenatal and Postnatal Aspects. *Clinical Medicine Insights: Pediatrics*, 10:CMPed.S40070.
- Sivapriya, S. M., Parida, L. 2015. A study to assess the knowledge and practices regarding prevention of anemia among antenatal women attending a tertiary level hospital in Pune. *IJSR NET*, 4(3):1210-1224.
- Tabrizi, F. M., Barjasteh, S. 2015. Maternal Hemoglobin Levels During Pregnancy And Their Association With Birth Weight Of Neonates. *Iran J Ped Hematol Oncol*, 5(4):211-217.
- Wang, C., Lin, L., Su, R., Zhu, W., Wei, Y., Yan, J., Feng, H., Li, B., Li, S., Yang, H. 2018. Hemoglobin levels during the first trimester of pregnancy are associated with the risk of gestational diabetes mellitus, pre-eclampsia and preterm birth in Chinese women: a retrospective study. *BMC Pregnancy and Childbirth*, 18(1):1-11.
- World Health Organization 2014. Global targets 2025: Poster. To improve maternal, infant and young child nutrition. Accessed on: 25 Apr 2020.
- World Health Organization 2016. Strategies to prevent anaemia: recommendations from an expert group consultation, New Delhi, India, 5-6 December 2016. Regional Office for South-East Asia, Accessed on: 25 Apr 2020.