

A review of the validity and reliability of assessment instruments for the final examination for the midwifery students of nursing and midwifery faculty of Mashhad

Nahid Jahani Shoorab¹, Nahid Golmakani¹, Seyed Reza Mazluom², Kobra Mirzakhani¹, Sedighe Azhari¹, Afsaneh Navaiyan¹

¹ MSc of midwifery, Lecturer and faculty member of Department of Midwifery, School of Nursing & Midwifery, Mashhad University of Medical Sciences. Mashhad, Iran

² PhD student of Nursing, Lecturer and faculty member of Department of Nursing, School of Nursing & Midwifery, Mashhad University of Medical Sciences. Mashhad, Iran

MirzakhaniK@mums.ac.ir

Abstract: According to WHO, the annual mortality rate for mothers is 515000 cases in the world. Most of these deaths can, however, be prevented when skills and knowledge are enhanced in the delivery ward. The poor performance of the delivery supervisors in Iran can be held accountable for most of the mother deaths. The lack of an objective tool reduces the possibility of a systematic and valid evaluation of the clinical examinations particularly at postgraduate programs. Therefore, the present research was conducted to investigate the validity and reliability of assessment instruments for the final comprehensive examination for the midwifery students. In this study, based on the checklist available at the faculty, the students' skills were studied in four test fields (delivery room, clinical gynecologic unit, parental care unit, and mother and children health). Thirty one students (22 from term eight and 9 students from term six) were selected in five consecutive days by two examiners (one of the examiners had no knowledge about the educational level and scientific knowledge of the students). For the face validity and content validity, the experts in the field were consulted. In addition, the criterion validity (the correlation between the score means in the clinical and theoretical courses and the students' total average from the final comprehensive examination) and the construct validity were separately calculated. To calculate the internal consistency, the Chronbach's alpha coefficient and the equivalence reliability (the correlation between the scores was separately reported by the two examiners) were used. The correlation coefficient in the final comprehensive examination of the midwifery program with an average score of 0.22 and 0.52 ($p=0.01$) for theoretical and clinical courses, respectively proved to be the desirable criterion validity in the assessment forms. Besides, the face validity and the content validity with a high reliability index (0.6-1) were confirmed. The occurrence of high to middle Alpha coefficient reliability (0.51-0.83) in every field of the examination showed an internal consistency in the available checklist. Following the definition of the criteria for the values of the scores, the lowest, and the highest reliabilities were determined to be 0.82 and 73.5%, respectively. This study concluded that the assessment instruments of the final comprehensive examination at the bachelor degree for the midwifery students at the nursing and midwifery faculty in Mashhad, Iran, are recommended as the valid and reliable forms for the assessment of the students at their educational career.

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1. Introduction

A major part of the educational process is to assess the academic progress and evaluate the amount of the students' learning. As the definition runs, the assessment of the educational progress is to evaluate the performance of the learners and compare the results with the predetermined educational objectives in order to decide whether or not these educational activities lead to desirable results; whether the intended goals have been achieved and to what extent the goals have been achieved (1). Chronbach has collected the assessment and defined the application of the data in order to decide on the educational

program (2). So it is necessary to make sure about the appropriateness and compatibility of the assessment methods with the goals specific to learning. Unfortunately, there are some shortcomings in the way the clinical regular examinations are held which may include the high number of participants in each exam, the short and limited time allocated for the evaluation and also the non-objectiveness of the evaluation (3). In a research study conducted in 2001 on the dissatisfaction of the medical students with the way the evaluation is made, Bahreini reported a 46.6% non-correspondence in the final score with the skills acquired. About one third of the trainees

emphasized the necessity of reviewing and changes in the assessment (4). This dissatisfaction was also sometimes expressed by the clinical trainers. For example, in an assessment of the nursing clinical skills in Indonesia (2007), about 20% of the trainers expressed dissatisfaction with the method of evaluation and about 21% of the trainers felt sorry for the failure of the students in the final examination due to their judgments. Even 52% of the trainers reported that they held themselves accountable for the failure of the students in the final examination (5). However, the importance of the desirable evaluation of the midwifery students becomes known at the graduation when it is necessary to pay attention to consequences of the lack of essential skills in controlling the women especially the pregnant ones. According to the World Health Organization (WHO), the annual occurrence of 515000 cases of deaths in mothers in the world indicates that it is required to provide more training and further delivery skills (5). According to the statistics of 2002, Iran also stresses this point. Although 80% of the delivery is conducted by the university-educated people, the case study on the mortality of the mothers shows that there is malfunction in the delivery ward (6). Attention to these facts can enhance the sensitivity and attempts of the clinical midwifery trainers in reviewing the required midwifery skills. Granland & lyn (1990) classifies learning skills as the career skills that cannot be assessed by the common examinations and believes that practical tests are required in this regard (1) For the evaluation of the clinical qualifications, there have been various suggestions such as portfolio, objective structure clinical skills (OSCE), direct observation, written examination etc. (7).

One of the practical tests is the portfolio. To show his capabilities and progress and for the sake of evaluation, the learner provides the instructor with some samples of the work he has done during a certain period of time. DEMBO (1994) says that one of the obstacles to these modern methods of evaluation is the determination of the validity, reliability and the style of evaluation in different steps. Performance in the simulation situations can be one of the practical tests. In this method, the learner is required to perform an activity in a simulated and artificial situation as he does in the actual one (1). Today, for most of the clinical skills, the OSCE has been designed. The advantages of this method include the consistency of the examination situation, the standard patient, and lack of stress. However, before these tests are conducted, it is necessary to have a suitable and reliable checklist.

Another type of practical test is the direct observation which facilitates the assessment of the clinical skills of the medical sciences group.

However, in the study of the specialized clinical techniques via the direct observation method, there is a doubt, in fact, an objection which is the result of the non-centralized nature of this instrument and the effects of other variables such as the inclination of the examiners, a change in the behavior of the examinees and so on. Therefore, for the enhancement of accuracy in the process of observation, the use of the DOPS system is recommended. In this method, in addition to observing the learner at work, the academic staff has to pay attention to checklist items which are under evaluation and are pre-designed. At the end of the work, the evaluators must flag the appropriate items in the checklist to specify the results of their observations (8). Thus, the checklist method is an organized style for reporting the observer's or observers' judgments. COOPER (1994) stressed the feature of "being important" as one of the characteristics which should be evaluated in the checklist method. In the checklist method what is recorded is just the presence or absence of the feature or its quantity. The attributes of a good checklist include the brevity and clarity of and the emphasis on the observable behavior and recording of the important behaviors. Like the checklist method, the scaling method is used for the facilitation of the observer's evaluation of the performance or style of the application. Other effective factors in improving the scaling method include checklist, being important, observability, and clarity of the points on the scales and unaccountability of the evaluators in case of doubts. In addition to the method for the evaluation of the clinical qualifications which is mainly based on the conditions and practicality of its application, it is necessary to pay attention to the criteria of a fair examination such as validity, reliability and objectivity (9) Based on the definition, a test is claimed to be valid if it can measure what it is intended to measure. However, by reliability it is meant that the instrument can produce identical results in identical conditions at different times. Most sources emphasize that in all kinds of research, the reliability instrument should be reviewed whether it is a survey, a mechanical instrument or a human observer (10). In the study of the skill techniques, the Royal College of Women and Midwifery (2006) focuses on the validity and reliability of the instrument, and recommends that in any instrument the construct validity, content validity and face validity be concurrently tested and the evaluators' agreement be sought (11). With an instrument having validity and reliability, it will be possible to be sure about the proper evaluation which will finally be achieved by an increase in the satisfaction of the students and the evaluators.

Now, in the nursing and midwifery faculty in Mashhad, Iran, for the clinical evaluation of the midwifery students, the observational instruments along with the checklist are used in four fields of delivery room, clinical gynecologic unit, parental care unit, and mother and children health. In a study on the percentage of satisfaction of the midwifery students with the final examination in 2008, Farokhi et al reported that the degree of satisfaction was 80, 71.9, 75.75, and 67.4 in four fields of delivery room, clinical gynecologic unit, parental care unit, and mother and children health respectively (12). Hence, as the studies show, the researchers consider the validity and reliability measures and the way the evaluation is made as the first educational priority of this faculty for the enhancement of the satisfaction of the students and the instructors. This can guarantee the objectivity and fairness of the examination, because lack of objective goals and an objective instrument can not only reduce the possibility of systematic and valid assessment of the students at the time of graduation, but it can also make it impossible to make arrangements for interventions to boost the performance of the students after graduation. Therefore, this research has been grounded on the fact that there is limited amount of research in this field and the results of this study can lead to the improvement of the quality of clinical education with special emphasis of the educational process on the validity and reliability of the instrument of evaluation.

2. Material and Methods

In this research, for the study of the validity and reliability of the evaluation forms of the final comprehensive examination of the midwifery students, one week before the official final comprehensive midwifery examination in the faculty, with the help of these instruments, an exam was held in four fields of delivery room, clinical gynecologic unit, parental care unit, and mother and children health. In each exam, there were two examiners one of whom were from outside the faculty and were unaware of the study level and knowledge of the students who were going to be assessed. At the beginning, the examiners were requested not to talk with each other about the educational term and their previous acquaintance with the study students before the forms were completed. In inviting the external examiners (experts working in health centers or Azad University), the researchers tried to choose those whose field of interest and expertise corresponded with the type of the examinations. When they expressed readiness to cooperate in this field, first they had to have a two-hour-long session to get acquainted with the content of the forms of the final

comprehensive examinations and learn how to fill in the forms and how the forms were graded by those in charge of midwifery at the presence of the researcher. After the examiners became fully familiar with how to fill in the forms, these instruments were administered for five apprenticeship students in four different fields. Then the respective examiners with the help of the instructor of that field completed the forms and determined the correlation coefficient. After the determination of the correlation coefficient ($r > 0.7$), at the time of a similar final examination, the examiner became qualified to administer the exam with the help of one of the instructors of the group (the two-member groups of evaluation were specified with the nearest correlation coefficient would determine the study research units of all of the applying students of term eight. The participating students of term 8 had to have passed all the credit units of the undergraduate program. They were supposed to be introduced for the final comprehensive examination by the administrative department. The students of term 6 also had to have passed all the credit units except for the field course. In this research, for the evaluation of validity and reliability, different types of validity such as content validity, face validity, criterion validity, construct validity and equivalence reliability and internal homogeneity were taken into consideration. To statistically analyze the obtained scores, the study units were converted to percentage by means of the checklist and the scaling methods. The variance analysis test and t-test were used to compare the means and the correlation coefficient and Chronbach's alpha. After the educational goals were specified on the basis of the objectives of exam courses, the evaluation instruments in terms of content validity for the final examination of the midwifery students were placed against each question as Necessary, Useful and Not necessary. The questionnaire was given to five experts in the field and they were requested to choose the appropriate item for each question. According to the formula (LAWSHE formula), the content validity Index (CVR) was determined. If the index turned out to be positive, it signified that there was some validity in half of the questions. For the face validity, the experts in the field were consulted and the academic staff would determine the content validity. What would be used for the criterion validity included the validity coefficient or in other words, the correlation coefficient between the means of the theoretical and clinical scores of research courses and the scores obtained in the comprehensive examination as well as the correlation of the total score with the means of the theoretical and practical courses. A validity index of 7% signified the presence of criterion validity.

In order to verify the construct validity, the known-groups-technique was used. Therefore, the mean of the obtained scores of the study students would be evaluated. If the highest score belonged to the students who were at the highest level of educational program (students of term eight), there was a statistically significant difference and so the construct validity was verified because it showed that this instrument was able to differentiate between the individuals with different educational levels.

In order to determine the equivalence reliability, the exam was administered by two equivalence evaluators and it happened at the same time (with the direct observation of the performance). Then, the correlation coefficient was determined. For the internal homogeneity, the Chronbach's alpha was used. Since the final examination consisted of 40 sub-tests, the score variance of each part and the variance of the total score were calculated.

3. Results

In this study, 70.9% (22 individuals) of the participants were in term eight and started their program at nursing and midwifery faculty in 2006 and 29% (9 individuals) of the students were in term 6. The average age of the student participants was 22 (i.e. 20-25). 53.3% of them were married and 46.7% lived on campus. 80% of the students of term eight were fully satisfied with the style of final examination. In response to the questions related to the final comprehensive examination, 73.3% said that they were familiar with at least one of the examiners and 93.3% were familiar with the clinical atmosphere of the examination. In 80%, the examinations in four fields were held in the morning and the average time length of evaluation was 3.1 hours. The amount of perceived stress before, during, and after each field of the examination was calculated out of 10 which turned out to be 6.6., 4 and 2.8 respectively in the prenatal care unit. Table (1) shows the scores for the perceived stress in other exams.

Table1. A comparison of the mean of the stress scores in the final comprehensive examination according to time and field of examination

Field of exam Stress score	Health	Women	Delivery room	Prenatal	Result of tests of analysis and variance		
					P	dF	F
Before exam	7.2±2.6	6.3±2.7	6.7±2.7	6.6±2.2	.42 0	3	.950
During exam	5.7±2.6	3.9±1.9	4.5±3/.	4±2.7	.24 0	3	1.41
After exam	4±3.2	2.8±2.3	2.4±2.1	2.8±2.7	.43 0	3	.920
Result of tests of analysis and variance	F=2.24	F=1.67	F=1.6	F=1.6			
	Df=2	Df=2	Df=2	Df=2			
	P=0.11	P=0.19	P=0.20	P=0.001			

Table 2. The difference in the mean of scores in the test fields of the final comprehensive examination among students of terms 6 and 8.

Test fields	Students of term 6	Students of term 8	Difference in percentage	Result of Mann-whitny test
	Mean±SD	Mean±SD		
Prenatal	14.4±0.9	15±1.9	15±1.9	0.26
Delivery room	9±2.5	14.7±1.2	0.63	0.00
Women	12.8±2	13.7±1.8	0.06	0.26
Mother and child health	9.5±1.2	14.6±2	0.53	0.09
Final total score	45.7	58	0.26	0.01

Eighty percent of the examiners (15 individuals) from the academic staff who participated in running the examination were over 40 or so. Their average teaching experience was 12.3 years (1-23). The average age of the evaluators was 25 years with an average teaching experience of 2.5 years (1-3). In all cases, the examiners and evaluators had a master degree. There was a statistically significant difference between the age and the teaching experience of the

examiners and the evaluators ($p=0.001$). 73.3 % of the examiners emphasized the necessity of the final comprehensive examination in the field of midwifery. 33.3% of these examiners believed that if the students failed in this exam but proved their capacity during apprenticeship, it is essential to investigate the condition of running the final examination and finding out the reasons for the students' failures in the examinations.

The face validity of all of the assessment forms in different fields (delivery room, clinical gynecologic unit, parental care unit, and mother and children health) was confirmed by five midwifery specialists. The content validity of the assessment forms in the final comprehensive examination of the midwifery was also calculated by means of the LAWSHE formula in all cases except the following: In the prenatal assessment form in the questions related to establishing an appropriate physical atmosphere for individual features, the validity coefficient was 0.6 and in the assessment form of the students at the delivery room, the individual features and answers to the scientific questions had a validity coefficient of 0.6. In the assessment form for mother and children health related to continuation of giving milk and investigation into the nutrition of the breastfeeding mother and the control of the refrigerator and answer to the scientific questions, the validity coefficient was 0.6 and the

Table 3. Reliability of the components of the final comprehensive examination of midwifery based on internal consistency index

Test fields	Alpha index
Prenatal	0.27
Delivery room	0.69
Women	0.45
Mother and child health	0.16

Table 4 Reliability of the components of the final comprehensive midwifery examination according to the consistency coefficient index

Test fields	Alpha index
Prenatal and Delivery room	0.79
Women	0.68
Mother and child health	0.82

Only one item (number 1, related to the individual features) in the assessment form of the women unit was deleted due to the lowness of the validity coefficient (0.2). Following the comment by the experts, the assessment forms of the final comprehensive examination were modified.

4. Discussions

The results of the study show that the highest stress perceived by the students before, during and even after the exam lies in the mother and child health unit. The students experienced the least amount of stress during the exam in the women field and the least amount of stress after the exam in the delivery room unit (Table 1). Therefore, although the amount of satisfaction of the students of the nursing and midwifery faculty with the way the final comprehensive midwifery examinations were held in

2010 was relatively good (80%), with the improvement of the conditions and investigation into the differences between the exam units, there was a chance for promotion in the degree of student satisfaction. Since the 2008 attempts to enhance satisfaction, there has been an increase from 73.3% to 80% in the total satisfaction since 2010. Due to the importance of such an examination deemed by the 73.3 % of the midwifery instructors, it is necessary to make more investigations into this field. In a study on the way the nursing students are clinically evaluated, VENDI (2007) reported a figure of 6.1% of student dissatisfaction among 271 students in four educational centers in Jakarta. Although the evaluators reported the use of checklist in 75% of cases and the other methods such as video recording of the clinical reports and, on average, 3.3 hours (1-3) of evaluation per student were calculated, the students believed that the assessment score and the level of anxiety and stress depended on who evaluated them and how. This researcher finally says that for a desirable evaluation and enhanced satisfaction, it is necessary to take four factors into account: instructors, clinical atmosphere, evaluation methods and finally the students themselves. Differences in students demand differences in evaluation methods. Some of the solutions recommended by this researcher include the oneness of the evaluators and the examiners, the clarification of the educational goals, the increase in the number of evaluators and the duration of the evaluation, and encounter with similar cases during the clinical apprenticeship (5). Regarding the emphasis of most of the midwifery instructors (73.3%) on the necessity of running this test, it can be said that based on the four aforementioned factors, it is possible to achieve a higher level of satisfaction especially in the reduction of anxiety and stress in the students of the faculty.

The difference in the performance of the students of terms 8 and 6 in Tables (3-7) has shown that the results state that in the prenatal unit, the students of higher terms had an increase in score mean in examining the patients, extracting history, assessing and performing the special care. Although it was reported that this difference was only statistically significant in examining the patients, ($p=0.03$), the total average obtained by the students of term 6 was lower compared with that of the students of term 8 (14.4 ± 0.9 against 15 ± 1.9). Furthermore, unlike the expectations, the students of term 6 had a better performance, so with some training of this skill in the women unit in the lower terms, the students should have further awareness of the importance of giving training to the patients as a

way to prevent the dangerous side effects during pregnancy.

Other results of this research indicated a significant difference between the skill and performance of the students of years three and four in midwifery in all parts of the final comprehensive examination during delivery room unit (Table 4) shows the significant difference ($p=0.00$) in the average total score obtained by these two groups (9 ± 2.5 against 14.7 ± 1.2).

A comparison between the performances of the students in the field of women showed that there was a significant difference between the students of years three and four at the undergraduate program in midwifery in terms of examining the patients and the internal genital tract. There was a difference between the average score obtained by two groups of students ($12.\pm 2$ against 13.7 ± 1.8). Although this unit was not statistically significant, the students of term 6 got a higher score in uterine examination and smear test and diagnosis.

The result of this research in the performance difference of the high and low term students showed that in the mother and child unit, the skills of the students in the fourth year of undergraduate program in midwifery improves in three main fields: children's nutrition, vaccination technique and family planning. This difference was statistically significant (Table 6). Besides, the mean of the scores obtained in other items of assessment including investigating the children's common problems, special care, completion of files and records showed that the students of term 8 got a higher score. Although this difference was not statistically significant, there was a statistically significant difference between the total scores of students of term 6 and 8 ($p=0.02$).

The Royal Women and Midwifery College (2002) mandates the construct validity for each instrument for the assessment of skills. An instrument is claimed to have construct validity when it can differentiate the population with the intended characteristics from the population lacking those features. Accordingly, this college considers a test as having construct validity when it can distinguish the trained individuals from those who are not and it can even grade and compare the levels of the learners' education (higher or lower) (11). In an investigation into the skills of 31 surgeon assistants of years three and four in Toronto, FRIDLEECH (2002), using OSCE with checklist and Likert Scale, confirmed the construct validity in the checklist and scaling forms because there was a statistically significant difference ($p=0.001$) and the mean difference was 0.25% (79% against 89%) between the senior and junior students. The comparison between the results obtained in this

study showed that there was a significant difference by 26% in the total score mean in the final comprehensive examination of the students of term 8 (Table 7). Therefore, based on the definition given by the Royal Women and Midwifery College, it is confirmed that in this examination there is construct validity in the assessment forms of the midwifery students (13).

The Chronbach's alpha is used to calculate the internal consistency of the measuring instruments such as the questionnaire or the tests which measure different properties. For the calculation of the Alpha coefficient, it is necessary to calculate the variance of the scores of each subgroup of the questions and the total variance. The zero value shows lack of reliability and +1 indicates total reliability. So in this research, the Chronbach's Alpha internal consistency coefficient is used for the investigation of different fields of the test (prenatal, delivery room, women and mother and child health)(Table 9-12). These coefficients were determined as 0.77 for the prenatal unit, 0.83 for the delivery room, 0.50 for the women unit and 0.63 for the mother and child health. The results of this research also showed the average-to-good structure and consistency between the subtests of the final comprehensive midwifery examination. Of the factors which had effective roles in boosting reliability of the test were the length of the examination and identical questions in terms of content and average level of difficulty (17). Therefore, for the re-evaluation, the researchers compared the total scores of pregnancy and delivery (delivery room and prenatal) units with other test units in terms of internal consistency reliability. The coefficients indicated an increase in the total internal consistency, which is recommended by the researcher for the improvement of the internal consistency in the final midwifery examination.

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Corresponding Author:

Kobra Mirzakhani
Department of Midwifery, School of Nursing & Midwifery, Mashhad University of Medical Sciences.
Mashhad, Iran
Tel: +98.5118591511
Email: MirzakhaniK@mums.ac.ir

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