

Original Article

Evaluation of Knowledge Improvement by “Integrated Management of Neonatal & Childhood Illness” (IMNCI) Course

Muhammad Haroon Hamid¹, Muhammad Faheem Afzal², Saira Khan³, Rahila Yasmeen⁴

¹ Professor of Paediatrics, King Edward Medical University / Mayo Hospital, Lahore

² Associate Professor of Pediatrics, King Edward Medical University / Mayo Hospital Lahore

³ Health Officer, UNICEF Pakistan, Lahore Office

⁴ Professor & Dean, Riphah Academy of Research & Education, Riphah International University, Islamabad

ABSTRACT

Introduction: Integrated Management of Childhood Illness (IMNCI), taught by a 6-day training course, is an important initiative to decrease childhood mortality. Level 2 of the Kirkpatrick model entails the assessment of the learning achieved by training activity.

Objective: To assess improvement in the knowledge of IMNCI content among the participants of the 6-day IMNCI training program.

Methods: After taking approval from IRB, this one-group pre-test-post-test study was carried out in the Paediatrics Medicine Department, King Edward Medical University / Mayo Hospital Lahore over 3 months. By non-probability consecutive sampling, all 77 participants of three 6-day courses (with no previous formal training of IMNCI) were included in the study. To assess any improvement in the knowledge (Kirkpatrick Model Level 2), each participant filled a pre-test and a similar post-test after the training. Data was analyzed by SPSS software. As the data was not normally distributed, Wilcoxon test was applied to compare the overall median scores of pre-test and post-test. Kruskal-Wallis Test was applied for the comparison of the median scores of pre-test and post-test scores of each professional group. While Mann-Whitney U-test was applied for pairwise comparison of the pre-test and post-test scores between different pairs of professional groups.

Results: Of the 77 participants, there were 35 doctors, 20 nurses, 20 Lady Health Visitors, and 2 midwives. The overall median score was 3 (IQR 3) of the pre-test and 8 (IQR 2) for the post-test (p -value < 0.001). Except for the midwives, there was a statistically significant improvement in the median score of each group. Item-analysis of the questions showed that compared to the pre-test, the proportion of correct answers in the post-test showed statistically significant improvement for all the 10 questions. Pairwise comparison of the median pre-test and post-test scores between different professional groups did not show statistical significance except for the doctor-nurse pair.

Conclusion: IMNCI training program significantly increased the knowledge of health care providers with no statistical difference between the post-test scores of doctors, LHV's, and midwives.

KEYWORDS: IMNCI, Training program, Kirkpatrick Model, Childhood mortality, Knowledge evaluation

doi: <https://doi.org/10.53708/hpej.v4i1.100>

This is an Open Access article and is licensed under a creative commons attribution (4.0 international License).

INTRODUCTION

Pakistan has under-five mortality of 74.9 per 1,000 live births (Majeed & Munir, 2020). To reduce childhood mortality, the World Health Organization (WHO), UNICEF and other technical partners developed the Integrated Management of Childhood and Neonatal Illness (IMNCI). More than 100 countries have successfully adopted IMNCI (Mazumder et al., 2014; Nguyen, Leung, McIntyre, Ghali, & Sauve, 2013; Talati, Amin, & Nimbalkar, 2018). Cross-sectional studies from various parts of India assessing the skills of frontline workers identified

the need for further reinforcement among community health workers regarding IMNCI. (Boschi-Pinto et al., 2018; Rakha et al., 2013; Talati et al., 2018) In Pakistan IMNCI has not been widely implemented (Amin et al., 2015). One of the reasons, among others, is lack of conviction whether IMNCI training does any benefit to the knowledge base of the health care providers (Goga & Muhe, 2011). Since its introduction by Donald Kirkpatrick in 1959, Kirkpatrick Four-Level Evaluation Model has been widely used to assess the effectiveness of training programs of a wide range of trainings and educational courses (Kirkpatrick & Kirkpatrick, 2006). The evaluation model has been used for as diverse training courses from cardiopulmonary resuscitation to complex instructional designs (Dorri, Akbari, & Sedeh, 2016; Jones, Fraser, & Randall, 2018; Rafiq, 2015). Level 1 of the Kirkpatrick model (Reaction) evaluates the feelings of

Correspondence:

Dr. Muhammad Haroon Hamid,

Professor of Paediatrics KEMU,

Email address: profharoon@kemu.edu.pk

Received: November 30, 2020 **Accepted:** April 5, 2021

Funding Source: Nil

the participants about the usefulness and other aspects of the training program. Level 2 (Learning) assesses if the trainees have learned from the program. Level 3 (Behavior) helps understand how well trainees are applying what they have learned. Level 4 (Results) analyzes the final outcome or goal of the whole training program.

In collaboration with UNICEF, 6-day IMNCI training courses are periodically organized for doctors and other health professionals in the department of Paediatrics Medicine, King Edward Medical University/Mayo Hospital Lahore. The question is does this 6-day training course help improve the knowledge of the participants regarding the core content of the IMNCI program. With this background, this study was done to assess the improvement in the knowledge of IMNCI core content among the participants of the 6-day IMNCI training program.

METHODS

This study was conducted in Department of Pediatric Medicine, Mayo Hospital (KEMU) Lahore. As this is an ongoing training program aimed at training all healthcare providers working at primary and secondary centers of Punjab, all participants of three consecutive IMNCI training courses were included. Research Design was Quantitative, one-group pre-test-post-test study design and non-probability consecutive sampling was done. All the participants of 3 consecutive workshops, belonging to different primary and secondary level centers of Punjab and all healthcare workers – doctors, nurses, mid-wives, and Lady Health Workers were included in the study. Participants who had previous formal training regarding IMNCI were excluded from this study.

Approval from Institutional Review Committee (IRB)/ethical committee (2045/ RC/ KEMU dated 17/10/2019) was taken to conduct this study. All the participants of three consecutive workshops (held from July to September 2019), belonging to different primary and secondary level centers of Punjab were included. These participants did not have any previous formal training of IMNCI. To assess whether there was any improvement in the knowledge (level-2 of Kirkpatrick evaluation model), a structured multiple-choice question paper was used (Figure-1). The construct of questions was to test the knowledge of the participants on the core content of IMNCI. To prevent bias induced by apprehension, the purpose of the questionnaire was explained to the participants, and they were assured of full confidentiality. Each participant filled a pre-test question paper having 10 questions before the start of the course. Each 6-day

course comprised of interactive classroom sessions and clinical indoor and outpatient practice sessions. At the end of the course, each participant filled a similar post-test question paper, but the questions and the options were rearranged. Data of all the cases was analyzed through SPSS (version 22). The scores were not normally distributed (as assessed by the Kolmogorov-Smirnov test), so the score for each question among the participants was summarized as median and inter-quartile range (IQR).

Since data was not normally distributed, the Wilcoxon Signed Ranks test was used to compare overall median scores of pre-test and post-test. Statistically significant (p -value < 0.05) increase in the median score was considered as “improvement in knowledge about IMNCI”. Item analysis of the pre-test and post-test questions was done by Wilcoxon test. Data was further stratified according to the profession of the participants and analyzed according to the profession – doctors, nurses, lady health visitors (LHV), and midwives. Kruskal-Wallis Test was applied to compare median pre-test and post-test scores within each participant group. While Mann-Whitney U-test was applied to do a pairwise comparison of the pre-test and post-test scores between the different professional groups.

RESULTS

There were 77 participants in the three training courses 35 doctors, 20 nurses, 20 LHVs, and 2 midwives. There was a 100% response rate to the 10 questions of both pre-test and post-test. The median score was 3 (IQR 3) for pre-test and 8 (IQR 2) for post-test with a p -value of < 0.001 . Table-I shows the comparison of median pre-test and post-test scores for each professional group of doctors, nurses, LHVs, and midwives. Except for the midwives, there was a statistically significant improvement in the median scores of each group.

Item-analysis of the questions showed that compared to the pre-test, the proportion of correct answers in the post-test showed statistically significant improvement for all the 10 questions (Table II). The overall difference between the median scores of pre-test and post-test was 5 (mean 4.22 ± 1.94) with a p -value of < 0.001 . (Table III) shows the overall comparison of the median scores of pre-test and post-test within each professional group. This shows that both the baseline knowledge and the post-training knowledge of the professional groups were significantly different from each other as depicted by the respective median scores. (Table IV) shows the pairwise comparison of the median pre-test and post-test scores between different pairs of professional groups. It is clear from Table IV that the difference

in scores between pairs of professional groups did not show statistical significance except for the doctor-nurse pair where both pre-test and post-test scores were significantly higher amongst the doctors.

DISCUSSION

This study has put light on various important aspects of the IMNCI training program. Applying the Kirkpatrick evaluation model at level 2 to assess the improvement in knowledge about contents of IMNCI, showed an increase in the median scores after the 6-day training. Except for the midwives, there was a statistically significant improvement in the median scores of each group, hence improvement in the knowledge. Our findings are comparable with the findings from Africa where IMNCI has been successfully implemented (Simoes et al., 1997). Overall, the health workers performed well after IMNCI training, as observed by Simoes et al (Kirkpatrick & Kirkpatrick, 2006). Horwood et al (2009) also highlighted the importance of health workers' achieving competency at identifying signs of severe disease during IMNCI training. In the IMNCI training program, we not only focus on theoretical knowledge but also on the practical application of this knowledge, which perhaps, led to the improvement in post-test scores. Previous evaluations have also shown that health worker performance is adversely affected when the amount of clinical practice included in IMNCI training is reduced (Harerimana et al., 2014).

In the context of IMNCI, it is worth mentioning the discordance between the strategy, capacity building, and implementation. Whereas capacity building of the health professionals like the training program being evaluated by this study has been robustly carried out in various parts including India, the real change would not occur until emphasis is given to strengthening the system and improving community practices at the grass-root level (Aneja, 2019). Hence, it is important to evaluate at level 3 and level 4 of the Kirkpatrick model, to achieve the desired decrease in childhood mortality.

We used the Kirkpatrick evaluation model in our study that is widely used for the assessment of various teaching and training courses (Dorri et al., 2016; Jones et al., 2018; Rafiq, 2015). This model has the ability to identify the gaps between the theoretical and practical components, with emphasis on imparting practical skills. To close this gap, the teaching material should be designed to promote in-depth understanding and active participation in the learning process (Bates, 2004). Kirkpatrick evaluation model, however, is not the perfect evaluation model as has been highlighted in recent literature (Reio, Rocco, Smith, & Chang,

2017). Results of this study demonstrate that this training course can be effective in preparing health workers from first-level health facilities to take good care of sick children under 5 years of age in developing countries in an integrated fashion.

CONCLUSION

The 6-day IMNCI training program significantly increased the knowledge of health care providers undergoing the training. There was no statistical difference between the post-test scores of doctors, LHVs, and midwives. The IMNCI training program can be used to train all the healthcare providers involved in the care of children as far as knowledge dissemination is concerned.

LIMITATIONS AND WAY FORWARD

One of the limitations of the study is the lack of an appropriate sample size. The other limitation of the study is the lack of evaluation at levels 1, 3 and 4. Understandably, evaluation at level 3 (behavior change) and level 4 (impact analysis) is not possible for such a study design. We intend to follow the subject cohort subsequently to assess how much of what has been learned is being practically implemented by the trainees (Level 3 evaluation). Also, in the longer run, it would be worth looking at the change in childhood mortality as a result of these training sessions (Level 4 evaluation).

This cohort of the trained personnel should be followed to assess the effectiveness of IMNCI training at level 3 of implementation and level 4 of attaining the goals in early detection and management of sick children and decrease in childhood mortality.

ACKNOWLEDGMENT

We acknowledge the help of Mr. Asif Hanif (UOL) for help in data analysis

DECLARATION OF INTEREST

The author report no declaration of interest.

Table I: Group-wise Pre-test and Post-test Scores

Participant Group		Median \pm IQR	Z statistics	p-value ^a
Overall (n=77)	Pre	3 \pm 3	-7.57	< 0.001
	Post	8 \pm 2		
Doctor (n= 35)	Pre	4 \pm 2	-5.15	< 0.001
	Post	9 \pm 2		
Nurse (n= 20)	Pre	3 \pm 2	-3.94	< 0.001
	Post	7 \pm 2		
LHV (n= 20)	Pre	3 \pm 3	-3.80	< 0.001
	Post	8 \pm 2		
Midwife (n= 2)	Pre	2.50 \pm 0	-1.34	0.180
	Post	7.50 \pm 1		

^a Wilcoxon test was applied

Table II: Correct Answer Before & After Training

N=77

Q. No.	No. of Correct Answers (%)		p-value ^a
	Pre test	Post test	
1	15 (19.5%)	67 (87%)	< 0.001
2	31 (40.3%)	74 (96%)	< 0.001
3	10 (13%)	26 (34%)	0.002
4	27 (35%)	57 (74%)	< 0.001
5	45 (58%)	69 (89%)	< 0.001
6	21 (27%)	62 (81%)	< 0.001
7	23 (30%)	65 (84%)	< 0.001
8	47 (61%)	61 (79%)	0.004
9	12 (16%)	36 (47%)	< 0.001
10	33 (43%)	73 (95%)	< 0.001

^aWilcoxon test was applied**Table III: Overall Comparison of Pre & Post Scores between the Groups**

N=77

Group	Pre	Post
	Median (IQR)	Median (IQR)
Doctor (n= 35)	4 (2)	9 (2)
Nurse (n= 20)	3 (2)	7 (2)
LHV (n= 20)	3 (3)	8 (2)
Midwife (n= 2)	2.50 (0)	7.50 (1)
Z	7.92	8.9
p-value	0.048 ^b	0.030 ^b

^bKruskal-Wallis Test was applied**Table IV: Pairwise Comparison between Professional Groups**

N=77

Pairwise comparison between Professional Groups		Pre	Post
		p-value ^c	p-value ^c
Doctor	Nurse	0.041	0.004
	LHV	0.025	0.369
	Midwife	0.147	0.396
Nurse	LHV	0.602	0.068
	Midwife	0.623	0.701
LHV	Midwife	0.866	0.623

^cMann Whitney U-test was applied

REFERENCES

Amin, H., Yasin, H., Danish, S. H., Ahmad, F., Rasheed, S., Zehra, N., & Ara, G. (2015). Appraisal of knowledge, attitude and practices of trained doctors regarding IMNCI. *Pak J Med Dent*, 4(01), 47.

Aneja, S. (2019). Integrated Management of Newborn and Childhood Illness (IMNCI) strategy and its implementation in real life situation. *The Indian Journal of Pediatrics*, 86(7), 622-627.

Bates, R. (2004). A critical analysis of evaluation practice: the Kirkpatrick model and the principle of beneficence. *Evaluation and program planning*, 27(3), 341-347.

Boschi-Pinto, C., Labadie, G., Dilip, T. R., Oliphant, N., Dalglish, S. L., Aboubaker, S., Butron-Riveros, B. (2018). Global implementation survey of Integrated Management of Childhood Illness (IMCI): 20 years on. *BMJ open*, 8(7), e019079.

Dorri, S., Akbari, M., & Sedeh, M. D. (2016). Kirkpatrick evaluation model for in-service training on cardiopulmonary resuscitation. *Iranian journal of nursing and midwifery research*, 21(5), 493.

Goga, A. E., & Muhe, L. M. (2011). Global challenges with scale-up of the integrated management of childhood illness strategy: results of a multi-country survey. *BMC public health*, 11(1), 1-10.

Harerimana, J.-M., Nyirazinyoye, L., Ahoranyezu, J.-B., Bikorimana, F., Hedt-Gauthier, B. L., Muldoon, K. A., . . . Ntaganira, J. (2014). Effect of shortened Integrated Management of Childhood Illness training on classification and treatment of under-five children seeking care in Rwanda. *Risk management and healthcare policy*, 7, 99.

Horwood, C., Vermaak, K., Rollins, N., Haskins, L., Nkosi, P., & Qazi, S. (2009). An evaluation of the quality of IMCI assessments among IMCI trained health workers in South Africa. *PloS one*, 4(6), e5937.

Jones, C., Fraser, J., & Randall, S. (2018). The evaluation of a home-based paediatric nursing service: concept and design development using the Kirkpatrick model. *Journal of Research in Nursing*, 23(6), 492-501.

Kirkpatrick, D., & Kirkpatrick, J. (2006). *Evaluating training programs: The four levels*: Berrett-Koehler Publishers.

Majeed, M. M., & Munir, A. (2020). Pakistan: country report on children's environmental health. *Reviews on environmental health*, 35(1), 57-63.

Mazumder, S., Taneja, S., Bahl, R., Mohan, P., Strand, T. A., Sommerfelt, H., Martines, J. (2014). Effect of implementation of Integrated Management of Neonatal and Childhood Illness programme on treatment seeking practices for morbidities in infants: cluster randomised trial. *BMJ*, 349.

Nguyen, D. T. K., Leung, K. K., McIntyre, L., Ghali, W. A., & Sauve, R. (2013). Does integrated management of childhood illness (IMCI) training improve the skills of health workers? A systematic review and meta-analysis. *PloS one*, 8(6), e66030.

Rafiq, M. (2015). Training evaluation in an organization using Kirkpatrick model: a case study of PIA. *Journal of Entrepreneurship & Organization Management*, 4(03), 152-162.

Rakha, M. A., Abdelmoneim, A.-N. M., Farhoud, S., Pièche, S., Cousens, S., Daelmans, B., & Bahl, R. (2013). Does implementation of the IMCI strategy have an impact on child mortality? A retrospective analysis of routine data from Egypt. *BMJ open*, 3(1).

Reio, T. G., Rocco, T. S., Smith, D. H., & Chang, E. (2017). A critique of Kirkpatrick's evaluation model. *New Horizons in Adult Education and Human Resource Development*, 29(2), 35-53.

Simoes, E., Desta, T., Tessema, T., Gerbresellassie, T., Dagnew, M., & Gove, S. (1997). Performance of health workers after training in integrated management of childhood illness in Gondar, Ethiopia. *Bulletin of the World Health Organization*, 75(Suppl 1), 43.

Talati, K., Amin, A. A., & Nimbalkar, S. M. (2018). Implementation of a Pilot Test mHealth Application to Improve Home Based Newborn Care (IMNCI) in Remote Tribal Gujarat. *Journal of Clinical & Diagnostic Research*, 12(6).

AUTHOR'S CONTRIBUTION:

1. Muhammad Haroon Hamid (Professor of Pediatrics, King Edward Medical University / Mayo Hospital Lahore). Conceived the idea, planned study, literature search, write up, data analysis.

2. Muhammad Faheem Afzal (Associate Professor of Pediatrics, King Edward Medical University / Mayo Hospital Lahore). Data collection, data analysis, write up.

3. Saira Khan (Health Officer, UNICEF Pakistan, Lahore Office). Data collection, literature search.

4. Rahila Yasmeen (Professor & Dean, Riphah Academy of Research & Education, Riphah International University, Islamabad). Helped idea conception, literature review, review of the manuscript