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Evaluation of the Effectiveness of the E-Learning Program: Integral Part of Anemia Mukht Bharat Initiative: A Pilot Study Factors

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Abstract

Background: Anemia is a widespread global health concern impacting more than half of Indian population. As a part of the Anemia Mukt Bharat Initiative, the Asian Research and Training Institute for Skill Transfer (ARTIST) has designed an e-learning curriculum, offering accessible and interactive training to frontline health workers. In this respect, this study aims to assess the effectiveness of the e-learning course specifically for Accredited Social Health Activists (ASHA) and Frontline Healthcare Workers (FHCWs).

Methods: A pilot study with 50 participants included pre-training and post-training assessments. The training involved a comprehensive online course offered in batches of Tamil, English, and Kannada from May 2023 to October 2023. The assessment comprised of a 50-item questionnaire based on diagnosis, treatment, and counseling for anemia. Participant feedback on the training was also collected.

Results: This study included 50 participants, comprising females with an average age of 38.65. The preliminary assessment displayed an average score of 76.3%, which exhibited a pronounced increase to 91.1% following the training phase ($p<0.001$). Substantial shifts in knowledge were evident across various domains, including the identification and classification of anemia severity (58%), comprehension of oral and injectable iron doses (55%), awareness of side effects (42%), provision of dietary recommendations (48%), and explanation of the impact of anemia on both the mother and the baby (39%). About 96% of participants successfully passed the HSSC certification exam after completing the course. In terms of course feedback, 94% of participants perceived the training material as clear and comprehensible, 92% found it engaging, 96% were satisfied with the training delivery, and 98% expressed willingness to recommend this training.

Conclusion: The findings of this study validate the feasibility and efficacy of this virtual learning module in arming healthcare practitioners with an understanding of anemia. Findings suggest the replication of this study augmenting the sample size, with a focus on HCWs in rural areas.

Keywords: Anemia Mukt Bharat • Frontline health workers • Online training • Anemia • E-learning

Introduction

Anemia, a significant global health issue characterized by a deficiency in red blood cells or hemoglobin, affects over 2 billion people worldwide. According to the World Health Organization (WHO), anemia is defined by hemoglobin levels below 12 g/dL in non-pregnant women aged 15 years or older, below 11 g/dL in pregnant women, and below 13 g/dL in men aged 15 years or older. The criteria are widely used for global anemia diagnosis [1].

Globally, the prevalence of anemia in women of reproductive age reached 29.9% in 2019, impacting over half a billion women aged 15–49 years. Pregnant women exhibited a higher prevalence at 36.5%, compared to non-pregnant women (29.6%) [2]. An anemia prevalence of ≥ 40% in a population is classified as a severe public health problem. Studies in India indicate high rates of anemia: 53.2%

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among non-pregnant women, 50.4% among pregnant women, and 58.6% among children. Urban men and rural men experience anemia at rates of one in five and three in ten, respectively [3]. Iron deficiency emerged as a major cause of anemia, exerting profound societal and individual impacts [4]. The consequences include increased rates of maternal and infant mortality by 20-40%, with 40% experiencing abortion, and 26% having low menstruation flow. Furthermore, iron deficiency (anemia) adversely affects cognitive development in children by up to 28% [5].

Healthcare Workers (HCWs) play a pivotal role in managing anemia through early detection, diagnosis, and tailored treatment plans. HCWs administer treatments like iron supplements, blood transfusions, or recommend dietary changes. However, inadequate awareness among HCWs can lead to undetected anemia, causing delays in treatment, exacerbating symptoms such as fatigue and weakness, and allowing the condition to progress to severe stages [6]. A review study highlighted the role of healthcare professionals in providing facilities such as vaccination, infection control protocols, vaccination strategies, and antimicrobial stewardship, while also educating patients suffering from sickle cell anemia [7,8].

Limited resources, qualified trainers, and logistical issues in India pose challenges for onsite learning, especially for HCWs with demanding schedules. The nature of their profession involves long and irregular hours, making it challenging to commit to fixed training sessions. Last-minute schedule changes due to the urgency of patient care, the high-pressure healthcare environment, and associated fatigue also impact the effectiveness of in-person training. Consequently, there is a pressing need for flexible and accessible learning solutions that can address the unique challenges faced by healthcare professionals in India [4].

Virtual programs offer benefits such as accessibility, breaking geographical barriers, fostering work-life balance, and contributing to cost savings by eliminating physical infrastructure and travel expenses. Recognizing the crucial role of HCWs, the Asian Research and Training Institute for Skill Transfer (ARTIST) developed the Anemia Mukt Bharat (AMB) Certification Program. This program was designed to empower Accredited Social Health Activists (ASHAs) and frontline workers, who serve as the backbone of India's healthcare system, by providing comprehensive training. This ensures they possess the necessary knowledge and skills to effectively combat anemia. The initiative aligns with the goals of the AMB initiative, aiming to annually decrease anemia incidence by 3%. In this regard, the current study aimed to evaluate the effectiveness of E-Learning courses given to ASHA and frontline workers in three different languages.

Materials and Methods

Study design and setting

The current study employed a cross-sectional design to evaluate the efficacy of the e-learning course on Anemia that was taught in batches from May 2023 to October 2023 to ASHA and frontline workers in languages of Tamil, English, and Kannada. The tests were conducted at two intervals: Pre-training and post-training using a standard checklist evaluated by senior healthcare providers at ARTIST and course certifying body HSSC.

Eligibility criteria

Inclusion criteria included any healthcare provider or frontline healthcare worker across India willing to participate in AMB e-learning program.

Study participants and sampling

Frontline healthcare providers participating in the training sessions remotely registered on the Learning Management System (LMS). A total of 50 participants were recruited for the pilot study. To establish a baseline, a pre-training test was conducted, and subsequently, they were granted access to the entire course including, modules and assignments on LMS. The modules focused on anemia, encompassing its causes, signs, effects of anemia, treatments and preventive strategies, including dietary adjustments and lifestyle changes that were taught over three 90 minute online sessions. Learners could download and review the materials at their convenience. Convenient sampling was employed for this pilot study.

Data collection tool and technique

The data collection tool comprised of a 50 item multiple choice questionnaire with the initial section gathering demographic details such as age, gender, work experience, educational background, and workplace, position. The subsequent sections involved analysis of three aspects: Test (diagnosis of signs and symptoms of anemia), treat (therapeutic approaches, including available treatments, doses and side-effects), and talk (preventive strategies including dietary changes, lifestyle adjustments, and iron-folic acid supplements). Questions were aligned with course topics and learning objectives. Certification was granted upon achieving a score of 70% on the final online exams. Following the completion of the exam, a participant's feedback was requested to analyze the efficacy of these training programs.

Statistical analysis

All acquired data were recorded in an excel spreadsheet. To provide succinct summaries of the observed impact, frequencies, percentages, mean values, as well as paired t-test tables were computed.

Ethical approval

The Institutional Ethics Committee (IEC) granted the study ethical permission. All pertinent and required documents was sent to the Ethics Committee. After stating that participation in the study would be completely voluntary and that confidentiality and anonymity would be rigorously preserved, verbal consent was obtained. Using Google Forms, all study participants provided written consent as well.

Results

Fifty frontline health workers participated in the online Anemia Management and certification (AMB) training program. This group showcased a diverse demographic mix, encompassing representatives from various geographic regions and language backgrounds. The linguistic breakdown underscored a multilingual and inclusive approach, with 10% of participants using Tamil, 40% English, and 50% Kannada. Among the participants, comprising females with an average age of 38.65. The qualification distribution of workers in the training program was as follows: 36% (n=18) were undergraduates, 36% (n=18) were nurses, 6% (n=3) were occupational therapy assistants, and 22% (n=11) were from non-medical disciplines. Geographically, 70% (n=35) of the HCWs belonged to the state of Karnataka, while the remaining 30% (n=15) were from the state of Tamil Nadu (Table 1).

Category	N=50	Percentage (%)
Language		
Tamil	5	10%
English	20	40%
Kannada	25	50%
Gender		
Female	50	100%
Age (mean)	38.65	
Qualification		
Undergraduates	18	36%
Nurses	18	36%
OT assistants	3	6%
Non-medical disciplines	11	22%
Geographic distribution		
Karnataka	35	70%
Tamil Nadu	15	30%

Table 1. Demographic details of HCWs participated in the e-training course.

The pre-training assessment showed an average score of 76.3%, which increased significantly to 91.1% after training ($p<0.001$) (Figure 1). Significant knowledge shifts were observed in the following domains: Anemia severity identification and classification (58%), doses of oral and injectable iron (55%), understanding side effects (42%), offering dietary recommendations (48%), and explaining the impact of anemia on the mother and the baby (39%) (Table 2). 96% (n=48) of participants successfully passed the HSSC certification exam after completing the course. Regarding course feedback, 94% of participants perceived the training material as clear and understandable, 92% found it engaging, 96% were pleased with the delivery of the training, and 98%agreed to recommend this training (Table 3).

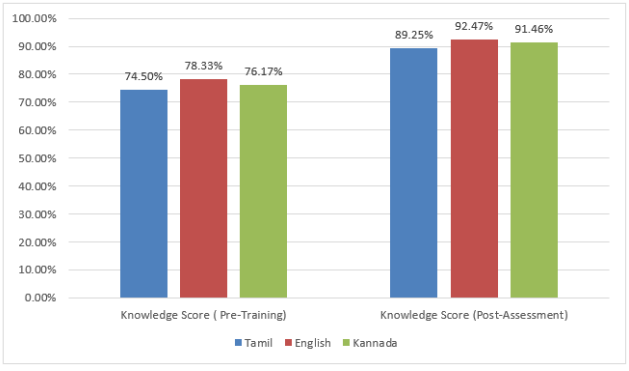

Figure 1. Pre-training and post-training knowledge scores of HCWs.

Modules	Anemic aspects	Pre-training (%)	Post-training (%)
TEST	Anemia severity identification classification into mild moderate severe and guiding further action	20	78
TREAT	Doses of oral and injectable iron	8	63
	Understanding side effects	26	68
TALK	Offering dietary recommendations	40	88
	Explaining about the impact of anemia on the mother and baby	22	61

Table 2. Pre and post-training percentages of anemic aspects in HCWs.

Sl. no.	Question	Choice	Responses (%)
1	How clear and understandable were the training materials provided?	Average	2
		Clear	4
		Very clear and understandable	94
2	How engaging and interactive were the training sessions?	Can be better	6
		Engaging	2
		Very engaging and interactive	92
3	Were the trainers effective in delivering the training?	Yes	96
		No	4
4	Would you recommend this training program to other ASHAs and FLWs?	Yes	98
		No	0
		No response	2

Table 3. Post-training feedback of participants.

Discussion

Anemia, a severe global public health issue marked by low red blood cell count or hemoglobin levels, is particularly prevalent in developing countries, with South Asia exhibiting the highest rates worldwide. In India, there is a notable prevalence of high iron deficiency anemia, affecting approximately 55% of the population. Addressing this concern, the Asian Research and Training Institute for Skill Transfer (ARTIST) leads the Anemia Mukt Bharat (AMB) e-certification Program, a crucial initiative aimed at empowering frontline HCWs, including ASHA.

The utilization of e-learning platforms in this initiative proved advantageous, offering flexibility in timing and pace of learning, enabling participants to access the program from the comfort of their homes, and languages. High success scores of the AMB virtual training reflect the program's high-quality teaching materials, instructors' professional credentials, and instruction in their native languages. Gharechedaghi M et al., supported the efficacy of virtual training courses in promoting knowledge, highlighting those distance-learning courses that can yield comparable learning outcomes to traditional face-to-face courses [9]. Similarly, a study conducted in China underscored the significant impact of e-learning on knowledge among primary care workers in the context of tuberculosis (P<0.001), where 57.3% of learners agreed that they could successfully apply the acquired knowledge to their professional practice [10]. In a systematic analysis, two randomized trials suggested a positive outcome, revealing a 61% improvement in HCWs' skills through e-learning [11]. However, HCWs' satisfaction with virtual training hinges on factors such as familiarity with online teaching techniques, faculty members' online teaching skills, the use of interactive approaches, having a personal workspace, and a self-reported longer attention span. Conversely, technical problems are associated with lower overall satisfaction levels. Blundell et al. also identified the primary factors influencing faculty satisfaction with online teaching during the COVID-19 pandemic including instructor-student interaction, technology errors, and institutional support [12]. Similarly, another study found that a significant proportion of nurse educators faced challenges during e-learning. Specifically, 81.8% (n=36) reported inadequacies in the internet speed, 77.3% (n=34) noted a lack of skilled teachers, while 72.7% (n=32) highlighted the shortage of computers overall, and school time organization, such as fixed lesson times. These studies collectively underscored the multifaceted challenges in embracing e-learning methodologies [13]. However, in this study, it was seen that connectivity was not an issue as majority

of the participants have had access to smartphones and computers with good connectivity. It is also seen that the skills of the master trainers play a very important role in e-learning. The impact of the training shows that 92% found it engaging and 96% were pleased with the delivery of the training

The cost-effectiveness of virtual training is another benefit. A comparative study revealed that the initial cost per participant for Virtual Reality (VR) training was $327.78, which was higher than the cost per participant for the live drill at $229.791. However, when the development costs were extrapolated to repeated training over 3 years, the cost per participant for the VR training dropped to $11 ss 5.431 [14]. Another study revealed that video-based training using online platforms can be effectively managed by a single resource person to impart knowledge and skills to the trainees, significantly reducing the cost of training ($p<0.001$). Moreover, virtual training eliminates the need for physical infrastructure and travel. A study found that the total expenses for in-person and virtual delivery were $24,547 and $13,725, respectively. This equates to a 44% reduction in the overall expenses for virtual workshop training compared to in-person training [15]. In a separate investigation it was demonstrated that the implementation of virtual training has the potential to decrease expenses for nursing students by up to 30% [16]. These studies further reinforce the cost-effectiveness of virtual training in healthcare, demonstrating its potential for substantial savings over traditional onsite training.

The virtual training revealed significant improvements, particularly in the classification of anemia, iron doses, along with understanding potential side effects, and the provision of counseling regarding diet plans. It can be explained by the fact that participants in the training program comprised of individuals with diverse backgrounds, including those not associated with the medical field (14%), and undergraduates (36%). The observed improvements underscore the importance of tailoring training approaches, to accommodate the diverse needs of participants [17]. The training approaches in this study was simple, local language, with role plays and interactive with real-life scenarios. The present study has inherent limitations, including a constrained sample size and restricted application to only two geographical areas. Future research endeavors should aim to replicate the study with a larger sample size, specifically targeting HCWs in rural areas to enhance the generalizability of findings.

Conclusion

This study demonstrates that this virtual learning module remarkably increased the knowledge scores of participants, specifically across identification and classification of anemia severity, comprehension of oral and injectable iron doses, awareness of side effects, provision of dietary recommendations, and explanation of the impact of anemia on both the mother and the baby. Additionally, participants indicated that the training material was clear, comprehensible, engaging, delivered effectively, and expressed a willingness to recommend this training. The success of this pilot study emphasizes the need to replicate this curriculum on a larger scale.

Consent for Publications

Not applicable.

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Conflict of Interest

The author(s) declare no conflict of interest, financial or otherwise.

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