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RESEARCH

Recognizing and addressing burnout among healthcare workers in rural Nepal: a proof-of-concept study using Kern's six-step theoretical framework

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Abstract

Introduction Healthcare provider burnout is highly prevalent and has negative consequences. However, many healthcare workers in LMICs, including Nepal, rarely recognize or ameliorate it. This problem is worse in rural settings. Competency-focused interventions that are developed using theoretical frameworks can address this gap.

Methods We used Kern's framework of curriculum development to create, refine, and assess a theory-driven intervention tailored to the needs and constraints of rural healthcare workers in Nepal. During the first phase, we conducted a targeted needs assessment using an online survey among nine rural primary care physicians working in Charikot Hospital. We then developed learning objectives for knowledge, attitude, and skills domains based on the World Health Organization (WHO) definition of burnout. Then, we created animated educational videos designed to meet the learning objectives. We then implemented the educational intervention with rural physicians and assessed their knowledge, attitudes, and feedback. During the second phase, we further developed the intervention based on findings from the first phase and assessed acceptability, feasibility, and preliminary impact using pre- and post-intervention questionnaires and key informant interviews.

Results In the first phase, nine physicians participated in the targeted needs assessment, and eight responded to the post-intervention assessment. In the second phase, 18 attendees completed the pre-intervention burnout assessment, and 16 completed both the pre-test and post-test questionnaires. On the pre-test, correct answers across questions ranged from 31–88%, while on the post-test, participants responded correctly 88–100% of the time. Related-samples Wilcoxon signed-rank test showed a statistically significant difference ($P = 0.007$) in the post-test scores on the knowledge domain. Qualitative results showed burnout as an unrecognized and unreported issue, and its drivers included stigma and feelings of helplessness. Participants praised the interventions and reported that they translated learned skills into practice.

Conclusion In this proof-of-concept study, we found that educational interventions developed using a theory-driven framework to meet the unique needs of rural healthcare workers are acceptable and feasible. Future studies can test the intervention impact in well-powered trials to support scale-up efforts to identify and address burnout.

Keywords Burnout, LMIC, Rural setting, Visual learning aids

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Background

Burnout among healthcare workers has been recognized as a global challenge since the early 1970s [1, 2], and its significance rose prominently during the COVID-19 pandemic [3–6]. The 11th revision of the International Classification of Diseases (ICD-11) of the World Health Organization (WHO) defines burnout as an occupational phenomenon resulting from chronic workplace stress that has not been successfully managed [7]. It is characterized by three cardinal symptoms: feeling of energy depletion or exhaustion, feeling of negativism or cynicism towards one's job, and reduced professional efficacy [7].

In the last decade, the prevalence of burnout among physicians and non-physician healthcare workers has been reported to be substantially high [8–11], and it has been recognized as a public health crisis in many high-income countries (HICs) [12, 13]. A systematic review from 2018 reported prevalence of burnout ranging from 0 to 80.5% among physicians [14]. Another systematic review and meta-analysis from 2022 on burnout among primary healthcare professionals in low- and middle-income countries reported single-point prevalence of burnout ranging from 2.5% to 87.9% [15]. A study done among medical students from nine countries showed burnout symptoms among 78–81% of the participants [16]. During the COVID pandemic, reports of burnout among healthcare workers ranged from 41–52% [17]. Despite this, there is a dearth of data on strategies to reduce burnout in low-and middle-income countries (LMICs) [15].

Healthcare workers are vulnerable to burnout due to the nature of their work, and this is substantially worsened in rural regions. They face frequent exposure to the physical and emotional trauma of their patients, isolation from professional and personal sources of support, lack of control and autonomy, and professional career challenges [18–21]. Organizational factors, including higher demands, lower resources, and inflexible organizational policies also predispose healthcare workers to burnout [22].

While not considered a medical diagnosis, burnout has widespread negative implications in the healthcare sector, both by increasing the risk of mental health conditions among healthcare workers [23], and by negatively impacting patients [9, 24]. Burnout increases medical errors, healthcare-associated infections, and patient mortality [9]. Among healthcare workers, burnout has been associated with poor job satisfaction, intention to resign from one's job, suicidal ideation, and an increase in medical malpractice lawsuits [9, 25, 26]. Burnout is associated with negative effects on professionalism, productivity, and the overall quality and viability of healthcare systems [27–29].

Nepal is an LMIC where almost 80% of the population lives in rural regions [30]. Although research on burnout among healthcare workers in Nepal is scarce, available evidence suggests that it poses a significant problem. Single-center observational studies examining healthcare worker burnout in the capital city of Kathmandu have revealed a high prevalence of burnout ranging from 42 to 66% [31–33]. An online survey conducted among 200 healthcare workers in a Kathmandu-based medical college showed symptoms of burnout in about 90% of the participants [34]. However, no study on burnout among rural healthcare workers from Nepal has been reported.

Various interventions in different settings have been proposed and implemented to address burnout. These include improving communication skills, engaging in team-building, creating participatory programs, promoting behavioral therapies, and providing psychosocial interventions such as yoga and mindfulness [19, 35–37]. An overview of systematic reviews and meta-analyses of interventions to reduce burnout among physicians and nurses recommended designing simple and feasible strategies Some strategies have been reported in Nepal: increasing family support, utilizing friend relationships, and reinforcing hobbies [34]. However, healthcare workers in rural settings often live far from family and friends, and face difficulties in building sustained peer support due to high turnover [38]. Other barriers to stress management include limited resources and time for engaging in hobbies and recreational activities. Unfortunately, mental health education among healthcare workers in many LMICs, including Nepal, is inadequate [39] and contributes to difficulty in recognizing and managing burnout. As such, a significant unmet need exists to develop and test feasible interventions tailored to rural healthcare workers' unique circumstances.

To address this large need, we developed and conducted a proof-of-concept intervention in rural hospitals of Nepal based on a structured, iterative theory-driven framework—Kern's six-step process of curriculum development [40]—to develop an intervention using visual learning aids. The aim of this proof-of-concept study was to test the feasibility, acceptability, and preliminary impact of an educational intervention developed using Kern's six-step theoretical framework to help healthcare workers identify and address burnout in rural Nepal.

Methodology

Study design

We used Kern's six-step process to develop an educational intervention to recognize and address burnout

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among healthcare workers. We used a mixed-methods framework to test and iteratively improve the intervention in two phases to assess and enhance the acceptability, feasibility, and preliminary impact.

Ethical approval

Ethical approval was obtained from Kathmandu University School of Medical Sciences Institutional Review Committee (KUSMS-IRC) (Approval no: 22/23). Participants provided informed consent electronically before participation. Key Informants Interview participants provided further informed verbal consent before the interview. All human subjects activities were performed in accordance with relevant guidelines and regulations under Kathmandu University's Institutional Review Committee.

Participants

The participants were healthcare providers working at two rural hospitals. Only physicians were included in the first phase, while physicians and non-physicians were included in the second phase. A convenience sampling method was used in both phases. Random sampling was beyond the needs of the goals of this study as the primary aim of our pilot, formative study is to assess a novel intervention's feasibility and acceptability, rather than to achieve generalizability.

Setting

Nepal is one of the poorest countries in the world, with a Gross National Income (GNI) per capita of USD 1340 [30], and ranks 146th in the global Human Development Index (HDI) [41]. The healthcare system in Nepal is struggling with post-federalization reform and a shortage of healthcare workers. According to the 2019 estimate from Global Burden of Disease [42] Nepal has 6.8 physicians per 10,000 and 27.8 nurses and midwives per 10,000 people, which is much lower than the recommended rate of at least 20.7 physicians and 70.6 nurses/midwives to achieve effective Universal Health Coverage. In 2023, the WHO included Nepal in the health workforce support and safeguard list [43], indicating that Nepal has a critical shortage of healthcare professionals. Fragile infrastructure, overcrowded hospital wards, long waits for treatment, shortage of healthcare workers, and low pay for healthcare workers are common in Nepal's public health system [44].The situation is even more troubling in the rural part of the country, where the doctor-to-patient ratio is as low as 0.067 doctors per 10,000 inhabitants [45].

Healthcare workers in Nepal are underpaid and overworked [46]. Most medical graduates (who complete MBBS, Bachelor of Medicine and Bachelor of Surgery) in the capital city work for more than 72 h per week [46], which is likely worse in rural settings due to severe physician shortages. Furthermore, healthcare workers in Nepal face a high frequency of workplace violence [47, 48], which is also worse in rural settings. In recent years, the migration of healthcare workers from Nepal to other regions of the world has further exacerbated the healthcare crisis in Nepal, which is likely to impact rural parts of the country disproportionately [49]. All these factors predispose healthcare workers in rural settings to an increased risk of burnout.

Study sites

The intervention was conducted in two rural hospitals in the Dolakha district of Nepal: Charikot Hospital and Dolakha Hospital. Charikot Hospital is a secondary-level governmental hospital, while Dolakha Hospital is a secondary-level outreach hospital owned and operated by Kathmandu University Hospital/Dhulikhel Hospital.

Study duration

Oct. 2020-March, 2022.

Intervention development

We developed the educational intervention using David E. Kern's six-step approach for curriculum development—an iterative, theory-driven, systematic and structured framework [40] that has been used in multiple settings [38, 50, 51]. It was developed by David E. Kern and colleagues at Johns Hopkins University in 1998 and has been widely used in various medical disciplines [52–54]. Its six steps include: 1) Problem identification and general needs assessment; 2. Targeted needs assessment; 3. Goals and objectives; 4. Educational strategies; 5. Implementation; 6. Evaluation and feedback. Given the iterative nature of the framework, we utilized two phases with different participant populations in different hospital settings to avoid contamination.

In the first phase, we completed all the six steps of Kern's framework. This phase was conducted in Charikot Hospital with nine physicians. In the second phase, we incorporated feedback from the first phase and refined and tested the intervention in Dolakha Hospital with 18 healthcare workers, including physicians and non-physicians.

We now provide details of the methods in both phases.

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Phase one

Kern's step 1: General needs assessment

We conducted a general needs assessment based on review of the research literature and the clinical and personal experiences of the study team as healthcare workers who have experienced burnout and/or provided support to co-workers who have experienced burnout. This helped identify burnout as an ongoing problem with a large unmet gap.

Kern's step 2: Targeted needs assessment

We surveyed nine physicians in Charikot Hospital. The survey questionnaire was sent to all participants via email. After providing consent for participation in the study, participants completed the questionnaire on the same day.

Kern's step 3: Learning objectives

We developed learning objectives targeting specific competencies in knowledge, attitudes, and skills. This provided consistency with the categories used in Kern's framework and are used by educational organizations such as the US-based Accreditation Council for Graduate Medical Education [55], and also our prior experience in educational interventions in Nepal [38]. To match the limited scope of the proof-of-concept study, we focused the learning objectives on (1) improving understanding of burnout and resilience (knowledge) (2) changing attitudes to start seeing burnout as a problem (attitude) and (3) increasing buy-in to utilizing deep breathing as a resilience method to mitigate burnout (attitude). After internal consultation among the research team members, which includes psychiatrists who have provided support for healthcare workers who have experienced burnout, we initially selected deep breathing as a simple and effective strategy to reduce stress that could be feasibly used by busy healthcare workers. Although the intervention included skills-based competencies, assessing skill acquisition was beyond the scope of this limited study, which did not have dedicated funding.

Kern's step 4: Educational strategies

We developed our educational strategies based on the WHO definition of burnout. We created two animated videos with a hypothetical case based on rural clinicians' lived experience, first showcasing burnout and second illustrating the positive impact of deep breathing. The videos included Nepali narration with English subtitles, which was the preferred modality for healthcare workers. A senior Nepali MDGP (MD in General Practice) physician (TKG), in consultation with a bilingual psychiatrist (BA) ensured accurate translation into Nepali and ensured that the content was culturally appropriate and applicable to the local context of physicians.

Kern's step 5: Implementation

We uploaded the animated videos to YouTube and forwarded the links to the participants through email and text messages. All the participants watched the videos on the same day.

Kern's step 6: Evaluation

We then conducted a rapid assessment after showing the videos to rural physicians at Charikot Hospital and collecting their responses on knowledge and attitude-based assessments using the survey platform Qualtrics. We collected immediate feedback from the participants while the content of the videos was fresh on their minds. This allowed us to quickly iterate and improve the intervention for phase one. As WHO defines burnout as 'a syndrome conceptualized as resulting from chronic workplace stress that hasn't been successfully managed', we designed attitude measures to incorporate this concept.

Phase two

Kern's step 1 (General needs assessment) and step 2 (Targeted needs assessment) were not repeated given the similarities of the two settings. So, we adapted the findings from the first hospital (Charikot hospital) from phase one into phase two.

Step 3: Learning objectives

We added knowledge and attitude-based learning objectives (in addition to those from phase one) related specifically to the utilization of behavioral activation as a resilience strategy to address burnout. These included (1) improving understanding of the nature, purpose, and benefits of behavioral activation (knowledge) and (2) increasing investment in the benefits of utilizing behavioral activation as a resilience method for mitigating burnout.

We added behavioral activation to phase 2 for multiple reasons. Feedback from phase 1 showed that while deep breathing was found to be helpful, participants noted that many of them use activities such as playing soccer to relieve stress. In addition, our team's clinical experience is that some participants can get more anxious when they are asked to focus on their breathing. Finally, behavioral activation is another low-cost yet highly feasible and effective strategy to reduce stress which has been used in the management of different mental health disorders including depression, anxiety and post-traumatic stress disorder (PTSD) [56–58]. For all of these reasons, we included behavioral activation as either an alternative

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or an adjunct to deep breathing as a strategy to relieve burnout.

Step 4: Educational strategies

Based on the assessment from the first phase, we iteratively refined the intervention in phase two by adding an educational video on behavioral activation as another strategy to address burnout (in addition to those from phase one).This video also had Nepali narration with English subtitles. KN wrote the script in consultation with BA, and then KK translated it into Nepali. BA is a bilingual psychiatrist who ensured the accuracy of translation and the appropriateness of the content.

Step 5: Implementation

Participants were gathered in a conference room, while following COVID precautions. After a brief introduction to the session, we sent the pre-test questionnaire to their email, including a consent form. The pre-test included questions on knowledge and attitudes regarding burnout, deep breathing, and behavioral activation. Immediately after this, three videos (one on burnout, one on deep breathing, and one on behavioral activation) were displayed one by one. After the first video on burnout, we held a discussion on burnout in healthcare where staff and students brought up their lived experiences. After the second video on deep breathing, participants were given 5 min to practice the steps of deep breathing together and discuss the effects they noticed. After the third video on behavioral activation, participants were given 5 min to think and share potential activities they would like to consider as a behavioral activation strategy. The whole session was conducted by KN and RKD and lasted about 60 min.

Step 6: Evaluation

The implementation session was immediately followed by a post-test assessment of knowledge and attitudes about burnout, deep breathing, and behavioral activation. We verbally collected group feedback at the end. In the next few hours, KN conducted qualitative interviews with seven key participants.

Data collection

We selected assessment methods to match the study's goals. The pre- and post-test questionnaires were developed to assess any changes in knowledge and attitudes that were directly targeted by the learning objectives.

Quantitative measures

All the survey questions were completed by the participants themselves using online platforms.

Phase one

We used Qualtrics, an online survey platform, for data collection. During targeted needs assessment, the survey consisted of 6 questions with yes/no response options and one open-ended question (What else do you do to cope with work stress?). Among the six questions, three assessed the presence of three cardinal symptoms of burnout as proposed by WHO: exhaustion, cynicism, and decreased professional efficacy. The remaining three questions assessed the impact of burnout on daily activities. After the educational intervention was developed and tested with this group of physicians, they completed a post-intervention assessment. This eight-question tool included three questions evaluating the knowledge domain with yes/no response options, and five questions evaluating the attitude domain measured on a five-point Likert scale ranging from strongly agree to strongly disagree. The attitude questions asked about items that may be considered facts (e.g., "burnout causes providers to make mistakes") based on the review of the literature, but we wanted to give an opportunity to the learners to share what they believe, because beliefs and attitudes affect behavior. All questions were in English, based on the physicians' preference. Phase one questionnaires are included in Supplement 1.

Phase two

Following Kern's guidance on iterative intervention development, we updated the intervention based on the findings from phase one. As such, we updated the questionnaires to ensure that they matched the final content of the intervention. During phase two, we conducted pre- and post-intervention assessments using the online platform Google Forms. The pre-test tool consisted of 19 questions in total. Six questions were the same set used in phase one: yes/no response options for recognizing the symptoms of burnout. The remaining 13 questions, which consisted of eight questions from phase one, assessed knowledge and attitudes related to burnout, slow breathing, and behavioral activation. Those 13 questions were then repeated in the post-test to assess any changes due to the intervention. Knowledge domain questions consisted of yes/no response options while attitude domain responses used a four-point Likert scale ranging from strongly agree to strongly disagree. We developed these questions to match the learning objectives from the third step of Kern's process for the updated version of the intervention. All questions and response options were in English and colloquial Nepali. As this phase focused on generalizability, we included non-physicians, many of whom preferred Nepali. We shared the animated videos with the participants. Immediately after the intervention,

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participants completed a post-test, which included the same set of questions from the pre-test to assess changes in knowledge and attitude domains. The questions and potential responses used in phase two are included in Supplement 2.

Qualitative measures

We conducted interviews to gather healthcare workers' personal reflections on the interventions, including factors that could not be adequately captured by the quantitative tools. KN, a psychiatrist and global mental health fellow, conducted key informant interviews with seven healthcare workers after the educational intervention in phase two. Each interview lasted for 30–45 min. We invited ten participants based on their availability with the goal of interviewing at least six participants, given the resource constraints of the study. We asked about the overall experience (i.e. 'aha moments' during the session), benefits of the intervention, and suggested improvements. We probed participants for their reactions to quantitative findings (Fig. 1).

We have used 'connecting' and 'following a thread' techniques for the integration of mixed methods. This method is also known as exploratory sequential (QUAN + QUAL) approach [59, 60].

Data analysis
Phase one

Because the goal of this phase was to rapidly collect initial impact data, responses from the post-intervention questionnaire are presented using descriptive analysis to demonstrate proportion and percentage scores among participants for the knowledge and attitude-based learned objectives.

Phase two
Quantitative analysis

We analyzed responses from participants who had completed both the pre- and post-test. To assess the change in knowledge, we used Wilcoxon signed-rank test to evaluate the differences between matched pairs of observations. To assess attitudinal changes, we quantified and compared the proportions of participants who expressed the target attitudinal competencies. We used SPSS v16 and set a 5% significance level to determine confidence of the results.

Qualitative analysis

We developed a preliminary codebook to match the purpose of the study by including themes such as drivers of burnout and experience with educational interventions. For each phase, a coder [ES] who was not involved in conducting interviews carried out the initial transcript review using thematic analysis to identify additional

codes. The coder discussed these with the KN, finalized the codebook, and then coded the transcripts, resolving differences by direct discussion with KN. The final number of codes generated from this process was 12.

Results
Phase one
Targeted needs assessment and prevalence of burnout symptoms and drivers

In phase one, all nine physicians who were available at Charikot Hospital participated in the initial targeted needs assessment. Given the risk of loss in confidentiality from the small number of participants, we did not collect demographic information beyond gender, and all nine were male. In the six-question survey, all the participants reported exhaustion, two-thirds reported a lack of empathy and cynicism while 22% of them reported signs of reduced professional efficacy. Two-thirds of participants affirmed that they were using unhealthy coping strategies (staying up late at night or using excessive amounts of alcohol) and 56% reported that they have no control over stressful problems at work, which is an established contributing factor for burnout (Table 1). Finally, 56% reported difficulty in completing routine, personal tasks such as cooking and cleaning.

Post-intervention assessment of knowledge and attitudes

Two months after the initial assessment above, our team developed educational materials as described in the methods section. We showed these two videos entitled "Burnout Video 1 Intro to Burnout" and "Burnout Video 2 Slow Breathing" to all physicians at Charikot Hospital. At this point, one participant had left the hospital, so the remaining eight participants completed the post-intervention assessment. 100% of participants correctly identified at least one symptom of burnout, 88% correctly recognized the WHO definition of burnout and 75% accurately identified the correct steps of slow breathing (Table 2).

For the assessment of attitude domains, two questions were about the impact of burnout, and three were about the benefits of slow breathing. As summarized in Table 3, participants expressed a preference in the direction of targeted attitudes by agreeing with the negative impacts of burnout and about the benefits of slow breathing exercise.

Phase two

In the second phase, we tested the new intervention (including the first two videos on recognizing burnout and using slow breathing, and a new video on using behavioral activation) in a different hospital to avoid contamination. We also wanted to increase the generalizability of the intervention beyond physicians. We invited 20

GENERAL NEEDS ASSESSMENT	Conversations with the stakeholders & literature review	Adapted from phase one	GENERAL NEEDS ASSESSMENT
TARGETED NEEDS ASSESSMENT	Using online survey (Qualtrics) Survey response from all 9 PCPs	Adapted from phase one	TARGETED NEEDS ASSESSMENT
GOALS AND OBJECTIVES	Defining knowledge, attitude and skills-based objectives to recognize signs of burnout, appreciate importance of addressing it, and learn deep breathing to manage it	Added objectives for behavioral activation	GOALS AND OBJECTIVES
EDUCATIONAL STRATEGIES	Developed two animated videos on burnout and deep breathing using Toonly software	Added a video on behavioral activation	EDUCATIONAL STRATEGIES
IMPLEMENTATION	Uploaded the videos to YouTube, Shared with the participants through email and text messages	Uploaded the videos to YouTube, Shared with the participants through email and text messages Participants watched the videos in the conference hall together	IMPLEMENTATION
ASSESSMENT AND FEEDBACK	Set of questionnaires on knowledge and attitude Using Qualtrics survey Post-test: 8 responses-all PCPs	Set of questionnaires on knowledge and attitude Using Google forms Pre-test: 18 responses Post-test: 16 responses Key informant interviews: 7 participants	ASSESSMENT AND FEEDBACK
PHASE ONE		**PHASE TWO**	

Fig. 1 Flow diagram for two phases

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Table 1 Phase one: Prevalence of burnout symptoms and needs assessment

S.N	Burnout Needs Assessment		
	Questions	Yes (%) (n)	No (%) (n)
1	I feel very tired after work	100% (9)	0% (0)
2	I feel that I do not care about my patients and co-workers as much as I would like to	67% (6)	33% (3)
3	I feel that my work makes a positive impact on others	78% (7)	22% (2)
4	To deal with stress from work, I do things that may cause problems for me later (e.g. staying up late at night watching videos, drinking more than I should)	67% (6)	33% (3)
5	I feel that I have no control over stressful problems that I face at work	56% (5)	44% (4)
6	I am able to complete necessary tasks in my free time such as cleaning, washing clothes, and cooking	56% (5)	44% (4)

Table 2 Phase one: Post burnout video knowledge assessment

S.N	Questions	Correct Response (%) (n)	Incorrect Response (%) (n)
1	Which of the following is a part of the WHO definition of burnout?	88% (7)	12% (1)
2	Which of the following is a symptom of burnout?	100% (8)	0% (0)
3	Which of the following is a step in slow breathing?	75% (6)	25% (2)

Table 3 Phase one: Post burnout video attitude assessment

S.N	Questions	Strongly Agree (%) (n)	Somewhat Agree (%) (n)	Neither Agree nor Disagree (%) (n)	Somewhat Disagree (%) (n)	Strongly Disagree (%) (n)
1	Burnout does not cause providers to make mistakes that could harm patients	0% (0)	0% (0)	0% (0)	25% (2)	75% (6)
2	Burnout causes providers to develop mental health problems	100% (8)	0% (0)	0% (0)	0% (0)	0% (0)
3	Slow breathing can help relax tense muscles	50% (4)	38% (3)	12% (1)	0% (0)	0% (0)
4	Slow breathing will not decrease anxious thoughts	0% (0)	0% (0)	0% (0)	63% (5)	37% (3)
5	If I practice slow breathing consistently, I can decrease burnout	37% (3)	63% (5)	0% (0)	0% (0)	0% (0)

healthcare workers, among whom 18 (90%) completed the pre-intervention questionnaire (Table 4), 16 watched the videos and 16 completed the post-intervention assessment and were included in the final analysis.

Burnout assessment

During the pre-test assessment 89% of participants reported at least one symptom of burnout. 83% of participants reported symptoms of exhaustion. 28% of participants reported symptoms of lack of empathy and cynicism while no participants reported decreased professional efficacy. 28% of participants affirmed statements that they use unhealthy coping strategies (i.e. staying up late at night watching videos, excess alcohol consumption) and have no control over stressful problems at work (Table 5).

Pre- and post-intervention assessment of knowledge and attitudes

Sixteen participants completed both the pre-test and post-test. Among them, 56% were females, 44% were physicians and 50% participants had work experience of less than 1 year.

Knowledge domain assessment

Sixteen participants who completed both the pre-test and post-test were included in the statistical analysis. The composite mean scores for all knowledge-based questions increased from 3.25 to 4.75 ($p = 0.007$) (Table 6).

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Table 4 Characteristics of participants

Characteristics of participants	n (%)
No. of Participants	18(100)
Male	8(44)
Female	10(56)
Professional Degree	
Physician	7(39)
Nurse	3(17)
Other clinical providers	3(17)
(Physical therapist, Dentist, Pharmacist)	
Other staff	5(28)
(Lab assistants, Lab technologist,	
Radiographer, HA, CMA,	
PHO, Admin assistant)	
Work Experience	
Up to 1 year	8(44)
1–5 years	7(39)
more than 5 years	3(17)

Attitude domain assessment

We observed improvement in measures across all the attitudinal responses on burnout, slow breathing, and behavioral activation (Table 7).

All attitude-based responses were found to move in the direction of targeted responses in the post-test.

Key informant interviews

We conducted seven key informant interviews with two medical officers (MO), one dentist, one health assistant (HA), one medical student, one radiographer, and one public health officer (PHO). The emerging themes from the thematic analysis along with salient quotes are presented below.

Burnout and its drivers

Participants reported that when they began their job, they had enthusiasm and motivation for completing their tasks. However, they experienced a gradual decrease in enthusiasm and productivity as their workload increased. Factors contributing to burnout included work-related stress, unpredictable and lengthy working hours with limited opportunities for breaks, mentally challenging activities, and the need to balance other commitments such as home, family, and friends. Participants also highlighted the lack of support for reporting medical errors and the fear of being reproached.

> *"In the beginning, we are energetic to work; later on, it gets down because of work stress, work pressure, mental pressure, missing home, and family and friends. People are hiding their mental problems here from themselves."* – Radiographer.

Burnout as an 'unspoken' and helpless issue

Participants stated that, although largely unrecognized and unacknowledged, burnout affected both individuals and the organization in terms of health and productivity. While participants said they could see the effects of burnout, it remained largely an unrecognized and unreported problem. They described unhealthy coping behaviors, such as alcohol consumption and substance abuse among co-workers. Participants believed that unrelieved burnout could lead to fatal consequences, including suicide. They described the issue of burnout as massive, pervasive, yet under-reported.

Expressing burnout was often perceived as unprofessional and indicative of a lack of self-management skills. Individuals with burnout often felt helpless, with no acknowledgment of the problem or expression of it to others. Burnout was viewed as a personal issue, a sign of weakness, with no proper solution. Continued burnout led to a lack of meaning in tasks, exacerbating the problem.

> *"People don't express it, but people feel it. All are exhausted, all are tired. Many people don't think their work makes a difference; some people can't express it because it has no solutions, but now after watching videos, I feel there are solutions."* – Health Assistant.

Table 5 Burnout assessment (*n* = 18)

S.N	Burnout Assessment (*n* = 18)		
	Questions	Yes (%) (n)	No (%) (n)
1	I feel very tired after work	83% (15)	17% (3)
2	I feel that I do not care about my patients and co-workers as much as I would like to	28% (5)	72% (13)
3	I feel that my work makes a positive impact on others	100% (18)	0(0)
4	To deal with stress from work, I do things that may cause problems for me later (e.g. staying up late at night watching videos, drinking more than I should)	28% (5)	72% (13)
5	I feel that I have no control over stressful problems that I face at work	28% (5)	72% (13)
6	I am able to complete necessary tasks in my free time such as cleaning, washing clothes, and cooking	83% (15)	17% (3)

Table 6 Phase two: Pre- and post-test knowledge scores

Pre- and Post-test responses

Questions		Correct Response Pre-Intervention ($n = 16$)	Correct Response Post-Intervention ($n = 16$)
1. Which of the following is part of the WHO definition of burnout?		75% (12)	94% (15)
2. Which of the following is a symptom of burnout?		88% (14)	100% (16)
3. Which of the following is a step in slow breathing?		31% (5)	100% (16)
4. Which of the following is an example of avoidance?		75% (12)	94% (15)
5. Which of the following is a step in behavioral activation?		56% (9)	88% (14)
Wilcoxon signed-rank test results			
Knowledge scores ($n = 16$)	Pre-test ($n = 16$)	Post-test ($n = 16$)	Wilcoxon Test Results ($n = 16$)
Mean (± SD)	3.25 (1.34)	4.75 (0.77)	
Median (Q1, Q3)	3.50 (3.00, 4.00)	5.00 (5.00, 5.00)	
Median difference			1.5 (CI 0.5–2.5)
Standardized Test Statistics (T)			83.50
Standard Error (SE)			14.11
Z-value			2.69
p-value			0.007

Table 7 Phase two: Pre- and post-intervention attitude assessment

S.N	Questions	Pre- and Post-intervention phase (*N* = 16)	Strongly agree % (n)	Somewhat agree % (n)	Somewhat disagree % (n)	Strongly Disagree % (n)
1	Burnout does not cause providers to make mistakes that could harm patients	Pre-test	6 (1)	31 (5)	25 (4)	38 (6)
		Post-test	13 (2)	6 (1)	25 (4)	56 (9)
2	Burnout causes providers to develop mental health problems	Pre-test	56 (9)	38 (6)	6 (1)	0
		Post-test	81 (13)	19 (3)	0	0
3	Slow breathing can help relax tense muscles	Pre-test	50 (8)	44 (7)	6 (1)	0
		Post-test	94 (15)	6 (1)	0	0
4	Exercise is a great example of behavioral activation because it produces endorphins in the brain that lift mood	Pre-test	75 (12)	19 (3)	6 (1)	0
		Post-test	100 (16)	0	0	0
5	Slow breathing will decrease anxious thoughts	Pre-test	38 (6)	56 (9)	6 (1)	0
		Post-test	81 (13)	19 (3)	0	0
6	Behavioral activation will decrease depressive thoughts	Pre-test	44 (7)	56 (9)	0	0
		Post-test	81 (13)	19 (3)	0	0
7	If I practice slow breathing consistently, I can decrease burnout	Pre-test	31 (5)	50 (8)	19 (3)	0
		Post-test	100 (16)	0	0	0
8	If I practice behavioral activation consistently, I can decrease burnout	Pre-test	69 (11)	31 (5)	0	0
		Post-test	94 (15)	6 (1)	0	0

Sense of being equipped with management skills for burnout after the intervention

After the educational intervention, participants felt they had gained effective skills in managing burnout. The presentation provided techniques for reducing stress and helped participants acknowledge burnout as a problem.

"Burnout videos were very relatable, felt like the videos were for me...so happy to get the management part, got some solutions. I practiced deep breathing twice yesterday. Behavioral activation is good, but deep breathing is better because in a minute I can feel relaxed. I feel so stressed sometimes." – Medical Officer.

"Before the presentation, I didn't know about burnout; I was suffering from it but didn't know it. Now

that I know it, I can exercise and do whatever makes me feel happy inside. I learned so much from the presentation. The best part is now I can manage burnout." – Radiographer.

Translation of the learned skills into practice

Participants reported practicing the techniques they learned in the intervention, such as engaging in physical activities after work as part of behavioral activation. They expressed that these activities increased their well-being and noted that they were more likely to express their feelings of burnout after the intervention.

"I most liked behavioral activation because in the medical profession, there is stress for everyone. I love to do exercise when stressed out, and it makes me feel very good. Even after work, I play football. When I work out, I feel very good, even after a 24-h work shift." – Medical Student.

"No one should be scared to share how they feel. [However], people are often scared that their organization/management will not take the issue in a proper manner but instead kick them out or take other punitive measures." – Medical Student.

Suitability of the approach

Participants found both deep breathing exercises and behavioral activation effective in managing burnout and suited their needs and capacities. The perceived suitability of these strategies was attributed to multiple items. First, participants appreciated the presentation being in their mother tongue (Nepali). They said deep breathing was helpful because it could be used immediately. Others said behavioral activation was appropriate because it encourages physical activity but also includes simple tasks like going for tea with your friends. For feedback, some said that suggested behavioral activities can include various types of tasks that are tailored to the learners so that they can be relevant to many different healthcare workers. The use of visual aids enhanced feasibility because rural healthcare workers rarely have access to in-person trainers and specialists.

Discussion

The proportion of burnout symptoms in our study is significantly higher than that reported in a few studies from LMICs [15, 61], but comparable to others [62]. The prevalence of burnout among rural health care workers in our study is found to be higher than the available single centered studies in urban settings. The difference of slightly lower proportion of participants reporting all the signs in the second phase might be due to difference in the organizational setting and the workplace burden of participants. This has been further explored in the qualitative interviews.

To our knowledge, this study is the first to report an intervention developed and tested using a theoretical framework to recognize and address burnout among healthcare workers (including non-physicians) in a rural LMIC. Results of this proof-of-concept study reveal that practical interventions (such as educational videos) that are developed by incorporating the needs and constraints of the learners are acceptable, feasible, and can improve both knowledge and attitudes among providers. We saw improvement across all measures of knowledge and attitudes in a diverse group of healthcare workers. The nature of the intervention (educational videos reflective of the learners' experiences) also assisted with acceptability and feasibility. Using the WHO's materials and evidence-based strategies such as deep breathing and behavioral activation helped enhance impact. There is a high potential for these simple yet tailored interventions to be deployed in similar rural settings.

Our study has several limitations. While the lack of a control arm was appropriate for the goals of the study at this stage, there are limitations on conclusions about the intervention's impact. Second, given the resource constraints, we did not assess if the intervention resulted in actual behavior change or if the knowledge and attitude improvements were sustained after the intervention. Third, our study measures did not undergo formal validation. Given the limited scope of this study that lacked dedicated funding, we used Kern's framework to ensure that the assessment tools directly probed items that were listed as specific learning objectives. However, future studies may utilize formal validation approaches such as internal consistency, test–retest on matching items, and factor analysis. Fourth, we collected quick verbal feedback after the videos but did not conduct formal interviews in the first phase. Finally, all participants in the first phase were male physicians. This lack of gender equity is emblematic of access to medical education and additional barriers women physicians face in working in rural regions. Since our study included all physicians in the first hospital, this likely biased our results. During the second phase, 56% of participants were women, supporting generalizability. Yet, because the sample size is small, the prevalence data are not nationally representative. Future studies should focus on addressing all of these limitations and understanding additional barriers and facilitators to implementation and scale-up.

The study also highlighted several additional areas of intervention that go beyond an individual-focused

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strategy. Participants reported that burnout was common but not addressed. While we were able to provide tools for the participants, ideally medical schools and other health professional institutions can incorporate these items during training. Participants also reported stigma against opening up about burnout and lacking control over stressors in their professional work. Employers will need to address these structural factors as the combined strategies both at the individual level and structural or organizational level have been shown to result in clinically significant reductions in burnout [29]. Data is also scarce regarding the coping strategies and support systems used by healthcare staff in Nepal. Additional research is needed to better understand the existing coping strategies, use of alcohol/other substances and sleeping pills, thoughts of self-harm or suicide, barriers to accessing support for mental health concerns, and suggestions on what can be done about these problems elicited from trainees and physicians themselves. These studies will be of benefit not only in Nepal but across LMICs in addressing the increasingly recognized prevalence of burnout [15].

The findings also indicate the gaps in formal mental health services. Given minimal education about mental health during medical training, many physicians may hold similar attitudes to the general population about the desire to solve mental health problems without seeking formal support. The 2020 Nepal National Mental Health Survey [63] revealed that wanting to solve the mental problem on one's own or believing the mental problem would improve by itself were the largest barriers to individuals seeking care, more than the financial or opportunity cost of seeking care or any stigma-related barrier. It is important to know if the attitudes of physicians mirror these trends, as implications also exist for the nature of medical training on mental health issues. If physicians hold these types of beliefs about mental health related to themselves, they are unlikely to be able to support patients with the same types of needs, pointing to the need for mental health education in medical training in Nepal.

Conclusion

This study provides valuable lessons for other contexts to develop or adapt their own tailored interventions to recognize and address burnout among healthcare workers, particularly those working in rural regions. This study demonstrates that visual learning aids developed through a structured framework tailored to the needs of the target population are not only acceptable and feasible but also potentially effective means to help healthcare workers identify and address burnout. It has further revealed several of the drivers and characterized stigma around

burnout among healthcare workers in rural hospitals. This calls for not only individual level interventions but also those aimed at structural or organizational levels to address burnout.

Abbreviations
GNI	Gross National Income
HA	Health Assistant
HDI	Human Development Index
HICs	High Income Countries
ICD	International Classification of diseases
LMICs	Low- and Middle-income countries
MBBS	Bachelor of Medicine and Bachelor of Surgery
MDGP	MD in General Practice
MO	Medical Officer
WHO	World Health Organization
PHO	Public Health Officer

Supplementary Information

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Supplementary Material 1.

Supplementary Material 2.

Authors' contributions
Conceptualization: ES, TKG, BA, Study design and methodology: ES, TKG, KN, RKD, KK, SBS, BA. Data collection and curation: ES, TKG, KN, KK, SBS, RKD. Data analysis: RKD, BA. Writing- Initial draft: RKD, AS. Writing- Review and editing: RKD, AS, ES, KN, TKG, KK, SBS, BA. Supervision: BA. All authors reviewed the manuscript.

Data availability
The dataset(s) supporting the conclusions of this article will be made available on request by the corresponding author.

Declarations

Ethics approval and consent to participate
Ethical approval was obtained from Kathmandu University School of Medical Sciences Institutional Review Committee (KUSMS-IRC) (Approval no: 22/23). Participants provided informed consent electronically before participation. Key Informants Interview participants provided further informed verbal consent before the interview. All human subjects activities were performed in accordance with relevant guidelines and regulations under Kathmandu University's Institutional Review Committee.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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