Abstract

Introduction: Under-5 mortality remains a significant challenge in resource-limited settings like urban Pakistan. Accurate data on mortality determinants are crucial for effective interventions. This study outlines a mixed-methods approach to refine the CHERG VASA tool for investigating under-5 mortality in Karachi’s slums.

Objectives: 1) Further validate the CHERG VASA tool quantitatively on a large, representative sample. 2) Gather qualitative feedback from users to assess user experience and identify areas for improvement. 3) Refine the tool based on combined quantitative and qualitative findings.

Methods: An explanatory sequential mixed-methods design will be implemented across 7 Karachi districts. The quantitative arm will employ stratified random sampling to recruit participants who experienced an under-5 death within the past 6 months. The CHERG VASA tool will be administered, followed by validation analyses including criterion validity against hospital records, content validity, construct validity, and reliability analysis. The qualitative arm will involve cognitive interviews and focus group discussions with participants to explore user experiences and gather feedback. Framework analysis will be used to analyze qualitative data. Tool refinement will be guided by both quantitative and qualitative findings.

Discussion: This mixed-methods approach integrates robust quantitative validation with in-depth qualitative insights, leading to a refined and context-specific CHERG VASA tool. This enhanced tool will provide reliable data on determinants of under-5 mortality in Karachi slums, informing targeted interventions and ultimately improving child health outcomes.

Keywords: verbal autopsy, social autopsy, validity, reliability, scale validation, mixed-methods

Layman Summary

Children under 5 in Karachi slums often die from unknown causes. This study aims to improve a tool called CHERG VASA that interviews families to understand why these children die. Researchers will interview families and healthcare workers to see if the tool is accurate and easy to use. They will then refine the tool to make it better for Karachi. This could help improve health programs and save more children’s lives.
Introduction
With 6.7 million children dying each year, the under-five mortality rate is still a serious problem worldwide [1]. With an under-five death rate of 74 per 1,000 live births, Pakistan is heavily burdened; urban slums such as those in Karachi are the epicentre of this tragedy [1,2]. Because of these resource-constrained circumstances, the real picture of child mortality causes is generally hidden due to variables such poor living conditions, limited vital registration systems, and insufficient access to healthcare [2].

Creating successful treatments requires accurate data on the factors that contribute to death for children under five. When resources are few, alternative methods such as verbal autopsy (VA) and social autopsy (SA) become indispensable instruments since traditional vital registry systems often fail to record reliable data [2,3]. While SA explores the more general societal and environmental elements that may have contributed to the tragedy, VA interviews carers to piece together the events leading up to a child’s death [2,3]. This data contributes to a more comprehensive understanding of the causes of paediatric fatalities, allowing for more focused actions to address certain risk factors.

Based on the “Pathways to Survival” conceptual framework, which examines a variety of biological and social factors that contribute to child mortality, the CHERG VASA tool provides an extensive framework for performing both VA and SA [2]. Although a preliminary validation study conducted in Karachi showed promise for the CHERG VASA tool, further improvements are required to maximize its cultural sensitivity and efficacy in this particular setting [5].

Key Findings from the Initial Validation Study:
The CHERG VASA test was used in the previous research [5] on a sample of 100 mothers who had recently experienced and under-five child death in Karachi. High validity and reliability were proven by the instrument, as evidenced by an Item-content Validity Index (I-CVI) of 81%, a Cronbach’s Alpha of 0.843, correct assignment of biological (92%) and social (97%) causes of death, and accurate differentiation between live and stillbirths (75-100%). However, the previous study [5] also identified certain limitations, such as: small sample size, more research is required to fully understand the cultural subtleties and linguistic preferences in the questionnaire, recall bias possibility in carer interviews, and extending the First Validation Analysis.

These constraints are addressed and the first validation is expanded upon in this mixed-methods research by using a bigger, more inclusive sample of people from all throughout Karachi’s slums using both qualitative and quantitative methodologies to examine the tool’s effectiveness and user experience enhancing the tool’s cultural sensitivity and efficacy in the unique setting of Karachi’s slums by using qualitative data.

Our study will improve child health outcomes for this vulnerable group, guide targeted interventions, and contribute to the collecting of more accurate and trustworthy data on the factors that contribute to death for children under five. Moreover, our knowledge of the factors that contribute to under-five mortality in Karachi’s slums might be greatly enhanced by this improved CHERG VASA tool, which addresses the shortcomings and builds on the encouraging findings of the original validation research. This may eventually lead to the saving of lives by opening the door for more potent therapies.

METHODS

Study Design and Setting:
An explanatory sequential mixed-methods design will be implemented across all seven districts of Karachi (South, Central, East, West, Korangi, and Malir), encompassing the diverse array of slum settlements that house a significant portion of the city’s population. This geographically representative approach ensures the findings accurately reflect the under-5 mortality landscape within Karachi slums.

Quantitative Arm
Sample Size and Sampling: Stratified random sampling, proportional to population across the seven districts, will be employed to recruit a statistically sufficient participant pool (family members, specifically fathers and/or mothers, of households) who have experienced an under-5 death within the past six months. This approach was chosen over other probability sampling techniques for several reasons:

- Improved representativeness: Stratification ensures that diverse groups within the population are adequately represented in the sample, minimizing bias and increasing the generalizability of results.
- Increased precision: Smaller sampling error within each stratum allows for a more precise estimation of true population parameters.
- Feasibility: Locating eligible participants within specific geographic areas simplifies recruitment compared to entirely random sampling.

However, we acknowledge that stratified random sampling also has limitations, such as the potential for selection bias if accurate population strata sizes are not available. To mitigate this, we will utilize pre-existing population data from reliable sources and rigorously verify participant eligibility during recruitment.

Data Collection:
Trained interviewers, fluent in the local language and culturally sensitive to the diverse communities within Karachi slums, will administer the CHERG VASA tool to participants. To minimize inter-observer bias, we will implement a multi-pronged approach:

- Rigorous interviewer training program: This program will cover the theoretical framework of the CHERG VASA tool, interview techniques, ethical considerations, and cultural sensitivity protocols. Trainees will undergo mock interviews and receive feedback to ensure proficiency.
- Regular inter-rater reliability checks: Trained supervisors will randomly observe a subset of interviews and independently record their own assessments of participant responses. Cohen’s kappa coefficient will be used to assess inter-rater agreement and identify areas for improvement in interviewer training or the questionnaire itself.

Data Analysis:
A comprehensive quantitative validation strategy will be employed, encompassing the following elements:

- Face validity: The questionnaire’s clarity, relevance, and comprehensiveness will be evaluated through expert review by local medical professionals and community leaders. Additionally, pre-testing with a small sample of caregivers will provide valuable feedback on cultural appropriateness and potential ambiguities.
- Content validity index (CVI): Expert ratings and pilot data will be used to calculate CVI scores for each questionnaire item, ensuring that they adequately represent the intended constructs and are relevant to the context of Karachi slums.
- Criterion validity: Cause-of-death assignments based on VA data will be compared to multiple gold standards when available, including:
  - Hospital records: Blinded reviews by two independent physicians will be conducted to assess the accuracy of cause-of-death coding against VA-derived cause assignments.
  - Lab tests and imaging: When available, laboratory test results and medical imaging reports will be considered in conjunction with hospital records and physician reviews for a more comprehensive evaluation of criterion validity.
- Construct validity: Exploratory and confirmatory factor analyses will be conducted to examine the underlying structure of the questionnaire and ensure it aligns with the theoretical framework.
of "pathways to survival." This will reveal how different questionnaire items relate to each other and contribute to the overall measurement of under-five mortality determinants.

**Discriminant validity analysis:** The tool's ability to differentiate between different causes of death and identify key risk factors will be assessed by examining the associations between specific questionnaire items and different cause-of-death categories.

**Reliability analysis:** Cronbach's alpha coefficient will be used to determine the internal consistency of the questionnaire as a whole. Additionally, test-retest reliability assessments will be conducted by administering the CHERG VASA tool to a sub-sample of participants twice with a predetermined time interval to evaluate the stability of responses over time.

**Cause of Death (CoD) Assignment by Physicians:** To ensure consistency in physician assessments of cause of death, the following measures will be implemented:

- **Standardized coding guidelines:** Physicians will be provided with a clear and detailed coding manual based on internationally recognized standards like ICD-10. This manual will outline specific criteria for assigning different cause-of-death categories based on available information from hospital records, lab tests, imaging, and VA data.
- **Blinded reviews:** All physician reviews of VA data will be conducted blindly, meaning physicians will not have access to any personal information about the deceased child or the cause of death listed in hospital records. This will minimize the potential for bias based on pre-existing knowledge or expectations.
- **Inter-physician agreement checks:** A subset of cases will be reviewed by multiple physicians independently to assess the level of agreement in cause-of-death assignments. Discrepancies will be discussed and resolved through consensus to ensure consistency and minimize subjectivity.

By employing a comprehensive quantitative validation strategy with these additional measures, we aim to ensure the accuracy, reliability, and generalizability of the CHERG VASA tool for under-five mortality investigations in Karachi's slums. This will ultimately contribute to improved data collection, targeted interventions, and better.

**Qualitative Arm:**

Understanding the complexities of under-five mortality demands not only robust quantitative data but also nuanced insights into the lived experiences of those impacted. This qualitative arm of the study delves deeper into participant experiences with the CHERG VASA tool through focused group discussions (FGDs). By uncovering potential difficulties, ambiguities, and cultural sensitivities around specific questions or sections, this layer enhances the quantitative data and informs targeted improvements to the tool, ultimately strengthening its effectiveness and cultural appropriateness.

A meticulously crafted moderator's guide is the cornerstone of successful FGDs. Informed by relevant under-five mortality research, cultural nuances within Karachi slums, and best practices in FGD methodology, the guide will evolve through a three-stage process. First, a comprehensive literature review lays the foundation for core discussion topics. Second, expert consultation from healthcare workers, community leaders, and experienced qualitative researchers ensures the guide's comprehensiveness and cultural sensitivity. Finally, a pilot FGD allows for fine-tuning of the guide, guaranteeing clarity, smooth flow, and effective probing techniques.

Standardization across discussion groups is crucial to ensuring meaningful comparisons and reliable data. To achieve this, all moderators undergo rigorous training in FGD techniques, ethical considerations, and cultural sensitivity specific to Karachi slums. A detailed protocol outlines the FGD procedures, including introductions, icebreakers, discussion prompts, active listening techniques, and standardized probe questions. Debriefing sessions after each FGD allow moderators to discuss emergent themes, address challenges encountered, and adapt the approach for subsequent groups.

Cognitive interviews play a vital role in continuously gathering user feedback and iteratively refining the CHERG VASA tool. A subset of participants will be invited to participate in these individual sessions, where they complete sections of the tool while verbalizing their thoughts and reasoning processes ("thinking aloud"). Open-ended probes by the interviewer delve into any confusion, uncertainty, or alternative interpretations of specific questions or instructions. Insights from cognitive interviews are directly incorporated into the tool revision process, informing further FGD discussion prompts and pilot testing of revised versions.

Purposive sampling ensures diverse participation in the FGDs, encompassing factors like demographics (age, gender, socio-economic status), geographic location within Karachi, and experience using the CHERG VASA tool (previous participants and first-time users). Three distinct groups are recruited: healthcare workers (doctors, nurses, community health workers), community leaders (religious leaders, social workers, neighborhood representatives), and family caregivers (parents, grandparents, and other close relatives) with experience using the tool during a previous under-five death investigation. This diversity fosters a comprehensive understanding of user perspectives and experiences.

Focus group discussions will be conducted in each of Karachi's seven districts, facilitated by trained moderators fluent in the local language. Open-ended prompts encourage participants to share their experiences with the tool, focusing on aspects like clarity and comprehensiveness of questions, ease of use and flow of sections, cultural appropriateness and sensitivity, and effectiveness in capturing relevant information. Audio recordings of the sessions preserve rich details of participant narratives for detailed analysis. Beyond FGDs, individual cognitive interviews provide a safe space for participants to freely express their thoughts and feelings while using the tool. Conducted in a quiet, private setting, these interviews maintain a non-judgmental and supportive atmosphere to elicit honest feedback.

The qualitative data journey culminates in a thorough analysis process. Audio recordings are transcribed verbatim, capturing the full nuance of participant voices. Guided by the study objectives and the "Pathways to Survival" framework, framework analysis uncovers key themes and patterns in the data. Triangulation, weaving together qualitative and quantitative findings, paints a comprehensive picture of the tool's effectiveness and cultural fit. Recurring patterns are identified and grouped into thematic categories, encapsulating user perceptions and experiences. Themes are then interpreted within the context of cultural nuances and the broader under-five mortality landscape in Karachi slums.

Finally, qualitative findings are combined with quantitative results to formulate actionable insights and guide specific revisions to the CHERG VASA tool. The goal is to enhance the tool's clarity, cultural sensitivity, and effectiveness in data collection, ultimately paving the way for improved understanding of child mortality and better health outcomes for vulnerable populations.

This multifaceted approach, integrating focus group discussions, cognitive interviews, and rigorous data analysis, promises to not only refine the CHERG VASA tool but also deepen our understanding of the human stories behind under-five mortality in Karachi's slums. By amplifying the voices of those directly impacted, the study ultimately lays the groundwork for more targeted interventions and a brighter future for children in these communities.

**Quality Control Measures:**

This study will employ a robust quality control strategy through its mixed-methods approach. Firstly, the quantitative validation will utilize rigorous techniques like face validity checks, content validity index calculations, criterion validity comparisons with hospital records, and multiple analyses (construct, discriminant, reliability) to ensure the CHERG VASA tool's accuracy and effectiveness in capturing cause-of-death data. Secondly, the qualitative component involving cognitive interviews and focus group discussions will provide valuable insights into user experiences and potential insights.
comprehension barriers, allowing for targeted modifications to improve the tool’s clarity, cultural sensitivity, and overall user-friendliness. This iterative process of combining quantitative and qualitative data ensures a high-quality, evidence-based refinement of the CHERG VASA tool for accurate and insightful investigation of under-5 mortality in Karachi slums.

Ethical Considerations:
Building trust and upholding respect: the CHERG VASA study prioritizes ethical research. Clear, accessible information empowers participants with informed consent, while data anonymization and secure storage safeguard confidentiality. Culturally sensitive researchers engage with communities, ensuring respectful interactions and incorporating feedback. This commitment to ethical conduct strengthens the study’s validity and impact, ultimately giving voice to participant experiences and informing crucial interventions.

DISCUSSION
This research, which combines qualitative and quantitative methodologies, reveals an important approach for improving the CHERG VASA tool. This tool is crucial for studying the causes of death among children under the age of 5 in the slums of Karachi. Through the combination of rigorous quantitative validation and detailed user input, we get a thorough understanding of the tool’s performance, user experiences, and underlying cultural prejudices. The core of enhancing precision, efficiency, and cultural awareness prior to extensive adoption is centered on this comprehensive methodology.

The research exhibits strong methodology and rigorous attention to detail, which are its main characteristics. Integrating both quantitative and qualitative methodologies provides a comprehensive assessment of the tool’s advantages and disadvantages. The large and inclusive sample guarantees a statistically reliable analysis and the capacity to apply the findings to urban slum settings as a whole. Thorough qualitative investigation, conducted via cognitive interviews and focus group discussions, provides insight into user difficulties, uncertainties, and cultural sensitivities, facilitating the process of improving tools in a focused and efficient manner.

However, the real strength of this study rests in its methodical process of improving and perfecting the tools used. This iterative methodology utilizes both quantitative and qualitative insights to enhance the performance and user experience of the CHERG VASA tool. Each adjustment is guided by transparent decision criteria and evidence thresholds, ensuring that every change is based on robust evidence and directly caters to the unique requirements of users. The thresholds include a spectrum of sensitivity levels for crucial cause-of-death categories, while also guaranteeing optimal positive predictive values to maintain accuracy without excessive diagnosis. Qualitative analysis identifies discrepancies and inconsistencies, which then inspire adjustments to particular questions, response options, and directions. These revisions aim to enhance clarity and ensure cultural appropriateness. The tool’s duration and complexity are modified depending on input to meet user stress and weariness.

This rigorous refining reaches its peak with a pilot test conducted on a smaller sample inside the same context. This pivotal stage enables the identification of geographical regions with elevated mortality rates, the determination of precise causes of death, and the monitoring of the efficacy of implemented treatments. Consequently, it facilitates a more streamlined and influential strategy for lowering mortality in children under the age of five.

Moreover, this research emphasizes the need for creating tools for public health that prioritize the needs and preferences of users. By using the improved CHERG VASA, a trustworthy and dependable instrument, researchers and health authorities may get more precise data on under-5 mortality. This data can then be used to guide targeted actions, leading to potential life-saving outcomes. This data enables the identification of geographical regions with elevated mortality rates, the determination of precise causes of death, and the monitoring of the efficacy of implemented treatments.

Thus, this work conclusively demonstrates the effectiveness of mixed-methods research in creating and verifying health tools, providing a helpful model for future research projects. The integration of quantitative and qualitative data yields a detailed comprehension of CHERS VASA: Revalidation Methodology for Karachi Slums

Implications and Prospects for the Future
The findings of this study have broader significance beyond the CHERG VASA tool, showing great potential for use in public health practice and research. An important consequence is the ability to enhance mortality statistics in situations with limited resources. By using the improved CHERG VASA, a trustworthy and dependable instrument, researchers and health authorities may get more precise data on under-5 mortality. This data can then be used to guide targeted actions, leading to potential life-saving outcomes. This data enables the identification of geographical regions with elevated mortality rates, the determination of precise causes of death, and the monitoring of the efficacy of implemented treatments.

Consequently, it facilitates a more streamlined and influential strategy for lowering mortality in children under the age of five. Moreover, this research emphasizes the need for creating tools for public health that prioritize the needs and preferences of users. By integrating user input at every stage, starting from the basic design to the final revision, we can guarantee that the tools are not only precise but also pertinent, comprehensible, and efficiently used by field implementers. Adopting a user-centered approach increases the likelihood of tools being embraced and maintained in real-world environments, hence maximizing their influence on public health outcomes.

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Abstract

Introduction: La mortalidad de menos de 5 años restne un défi important dans les contextes aux ressources limitées comme le Pakistan urbain. Des données précises sur les déterminants de la mortalité sont cruciales pour des interventions efficaces. Cette étude décrit une approche à méthodes mixtes pour examiner la mortalité infantile dans Karachi pour enquêter sur la mortalité de moins de 5 ans dans les bidonvilles de Karachi.

Objectives: 1) Valider davantage l'outil CHERG VASA quantitaivement sur un échantillon large et représentatif. 2) Recueillir des commentaires qualitatifs des utilisateurs pour évaluer la validité de l'outil CHERG VASA.

Method: Une conception explicative séquentielle à méthodes mixtes sera mise en œuvre dans 7 districts de Karachi. L'outil CHERG VASA quantitaivement sera administré à un échantillon stratifié et aléatoire de 5 districts, recueillir des commentaires qualitatifs des utilisateurs pour évaluer l'outil CHERG VASA quantitaivement et qualitativement.

Discussion: Cette approche à méthodes mixtes intègre une validation quantitative robuste avec des informations qualitatives approfondies, conduisant à un outil CHERG VASA raffiné et spécifique au contexte. Cet outil amélioré fournira des données fiables sur les déterminants de la mortalité et aidera à affiner l'outil CHERG VASA quantitaivement et qualitativement.

Keywords: autopsie verbale, autopsie sociale, validité, fiabilité, validation d'échelle, méthodes mixtes.
Abstract

La mortalidad de los niños menores de cinco años sigue siendo un desafío importante en entornos con recursos limitados como el Pakistán urbano. Los datos precisos sobre los determinantes de la mortalidad son cruciales para que las intervenciones sean eficaces. Este estudio describe un enfoque de métodos mixtos para perfeccionar la herramienta CHERG VASA, una herramienta de alta confiabilidad para la autopsia social y la investigación de la mortalidad infantil. Este enfoque de métodos mixtos integra una validación cuantitativa sólida con métodos cualitativos para recolectar datos en los barrios marginales de Karachi, informando intervenciones específicas y, en última instancia, confiables sobre los determinantes de la mortalidad de menores de 5 años en los barrios de la ciudad. Este enfoque aportará a un instrumento CHERG VASA que mejore los resultados de salud infantil. La mortalidad de los niños menores de cinco años sigue siendo un desafío importante en entornos con recursos limitados como el Pakistán urbano. Los datos precisos sobre los determinantes de la mortalidad son cruciales para que las intervenciones sean eficaces. Este estudio describe un enfoque de métodos mixtos para perfeccionar la herramienta CHERG VASA, una herramienta de alta confiabilidad para la autopsia social y la investigación de la mortalidad infantil. Este enfoque de métodos mixtos integra una validación cuantitativa sólida con métodos cualitativos para recolectar datos en los barrios marginales de Karachi, informando intervenciones específicas y, en última instancia, confiables sobre los determinantes de la mortalidad de menores de 5 años en los barrios de la ciudad. Este enfoque aportará a un instrumento CHERG VASA que mejore los resultados de salud infantil. 

Introducción

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Métodos

Discurso

Este enfoque de métodos mixtos integra una validación cuantitativa sólida con conocimientos cualitativos profundos, lo que conduce a una herramienta CHERG VASA refinada y específica del contexto. Esta herramienta mejorada proporcionará datos confiables sobre los determinantes de la mortalidad de menores de 5 años en los barrios marginales de Karachi, informando intervenciones específicas y, en última instancia, mejorando los resultados de salud infantil.

Palabras clave

autopsia verbal, autopsia social, validez, confiabilidad, validación de escala, métodos mixtos

Key messages

- Plans to robustly validate CHERG VASA tool for under-5 mortality in Karachi slums with a large, representative sample.
- Plans to employ in-depth qualitative feedback from users to refine the tool for cultural sensitivity and effectiveness.
- Demonstrates the value of a mixed-methods approach for tool validation and development in public health.
- Plans to contribute to improved mortality data, user-centered tool development, and mixed-methods research applications.

References