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Using Telemedicine to Help with Malnutrition Problems in Afghanistan

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Abstract

Background: This research is a systematic review and meta-analysis that investigates the incidence of using telemedicine to help with malnutrition problems in children under 5 years of age. The study includes seven studies published between 2016 and 2020, with a total sample size of 3,362 children.

Objective: To investigate the incidence of telemedicine use to address malnutrition in children under 5 years of age.

Methods: This research uses a systematic review and meta-analysis of 7 studies published between 2016 and 2023, with a total sample size of 3,362 children.

Results: The pooled incidence rate of telemedicine use was 0.81 (95% CI: 0.72-0.90), with moderate heterogeneity. Subgroup analysis revealed that the duration of the intervention was a significant source of heterogeneity.

Conclusion: This research suggests that telemedicine is a feasible and effective intervention to address malnutrition in children under 5 years of age. However, the duration of the intervention may be an important factor to consider when designing future studies.

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INTRODUCTION

Malnutrition is a widespread problem affecting children under the age of five in developing countries, including Afghanistan. Malnutrition is a major contributor to morbidity and mortality in children under five, with consequences ranging from stunted growth and delayed cognitive development to increased susceptibility to infectious diseases[1]. Telemedicine has been increasingly used to improve access to healthcare, especially in low-resource settings. This review aims to evaluate the effectiveness of telemedicine in addressing malnutrition among children under 5 in Afghanistan.

The prevalence of malnutrition in Afghanistan is among the highest in the world, with more than 3.1 million children under the age of five suffering from malnutrition[2]. Malnutrition is prevalent in both rural and urban areas of the country, with children in rural areas being more affected[3]. There is a critical need for interventions that can address this problem.

Telemedicine, defined as the delivery of healthcare services through telecommunication technology, has the potential to improve access to healthcare for children in remote and low-resource settings. The use of telemedicine can increase access to specialized care and reduce the time and resource burden on healthcare providers[4].

Acute malnutrition, chronic malnutrition, hidden hunger, and anemia are common nutritional problems affecting children under the age of five in developing countries, including Afghanistan. Acute malnutrition, also known as wasting, is a condition in which a child's weight is significantly lower than expected for their age and height [5]. Click or tap here to enter text. Chronic malnutrition, also known as stunting, is a condition where a child's height is significantly lower than expected for their age [6]. Hidden hunger refers to a lack of essential micronutrients such as iron, zinc, and vitamin A, which can lead to a range of health problems, including impaired immune function and cognitive development[7]. Anemia, characterized by a deficiency of red blood cells or hemoglobin, is also a common problem among children under the age of five in developing countries[8].

These nutritional problems are closely interlinked, with children often suffering from multiple forms of malnutrition simultaneously. Addressing these complex issues requires a multifaceted approach that includes improving access to nutritious food, promoting good feeding practices, and providing effective healthcare interventions.

Telemedicine has the potential to play a crucial role in addressing these nutritional problems in children under the age of five in Afghanistan. By providing remote access to specialized healthcare services, telemedicine can improve the accuracy and timeliness of diagnosis and treatment, leading to better health outcomes for children. Additionally, telemedicine can support community health workers and other healthcare providers in improving their knowledge and skills in managing malnutrition. Overall, telemedicine has the potential to be a powerful tool in the fight against malnutrition in Afghanistan and other low-resource settings.

Several studies have evaluated the use of telemedicine in improving the nutritional

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status of children under the age of five. In a study conducted in rural Ethiopia, telemedicine-based nutritional counseling was found to be effective in reducing the prevalence of stunting and wasting among children under 5 [9]. Similarly, a study conducted in rural India found that telemedicine-based nutritional counseling effectively improved the nutritional status of children under 5[10]. The study reported that the prevalence of stunting and wasting was significantly lower in the intervention group compared to the control group.

Telemedicine has also been used to improve the monitoring of the growth and nutritional status of children under the age of five. In a study conducted in Pakistan, telemedicine was used to monitor the growth and nutritional status of children under 5 in a remote, low-resource setting[11]. The study reported that telemedicine use improved the accuracy and timeliness of data collection, enabling early detection of malnutrition and appropriate interventions.

In addition to nutritional counseling and growth monitoring, telemedicine has also been used to improve the management of acute malnutrition. In a study conducted in rural Kenya, telemedicine was used to provide remote consultation and support to health workers in managing severe acute malnutrition (SAM) [12]. The study reported that telemedicine significantly reduced the time to admission and improved the quality of care for children with SAM.

Telemedicine has also been used to improve the training and capacity building of healthcare providers in managing malnutrition. In a study conducted in rural India, telemedicine was used to provide training and support to community health workers in managing malnutrition[13]. The study reported that telemedicine significantly improved the knowledge and skills of community health workers in managing malnutrition.

Telemedicine has shown promising results in improving the nutritional status of children under the age of five in low-resource settings, including Afghanistan. Telemedicine can increase access to specialized care, improve the accuracy and timeliness of data collection, and enhance the training and capacity building of healthcare providers in managing malnutrition. However, further research is needed to evaluate the long-term effectiveness and sustainability of telemedicine interventions for managing malnutrition in low-resource settings.

This research aims to evaluate the application of remote healthcare in pediatric nutrition by examining four key areas: the overall incidence and frequency of using telemedicine to manage malnutrition in children under five years old, the core methodological and design characteristics of existing studies in this field, the geographical distribution of this research alongside country-specific outcomes, and the duration of these telemedicine interventions to determine how intervention length influences implementation and usage rates.

METHODS

Study Design:

This study used a systematic review and meta-analysis to investigate the incidence of telemedicine use to address malnutrition in children under 5 years of age. The PRISMA

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guidelines were followed to ensure a comprehensive and transparent approach to the review process.

Search Strategy:

The search strategy involved a thorough search of PubMed and Google Scholar databases to identify all relevant studies from January 2005 to December 2023. The following search terms were used: "telemedicine," "malnutrition," "children," and "under 5 years." The search was limited to studies published in English and accessible through Google Scholar or PubMed.

Study Selection:

The study selection criteria were developed based on the PICOS (population, intervention, comparison, outcomes, study design) framework. Studies were included if they were original research articles published in peer-reviewed journals that investigated the incidence of telemedicine use to address malnutrition in children under 5 years of age. Studies were excluded if they did not meet the inclusion criteria or were not accessible through Google Scholar or PubMed.

Data Extraction:

Data were extracted from the included studies using a standardized data extraction form. The following data were extracted: study design, sample size, population characteristics, telemedicine intervention, and malnutrition-related outcomes.

Data Synthesis:

The data synthesis involved a meta-analysis of the included studies using a random-effects model. Heterogeneity was assessed using the I2 statistic. Forest plots were used to represent the results visually, and subgroup analyses were conducted to explore potential sources of heterogeneity.

Bias Assessment:

Potential sources of bias will be assessed using the Cochrane Risk of Bias tool [14]. This tool assesses the risk of bias in randomized controlled trials (RCTs) by evaluating the following domains: selection bias, performance bias, detection bias, attrition bias, reporting bias, and other sources of bias. In addition, the Newcastle-Ottawa Scale (NOS) will be used to assess the risk of bias in non-randomized studies[15]. The NOS assesses the risk of bias in observational studies by evaluating the following domains: selection of the study groups, comparability of the groups, and ascertainment of the exposure or outcome of interest.

Subgroup Analyses:

Subgroup analyses will be conducted based on the following factors: age, gender, type of malnutrition, type of telemedicine intervention, and study design. The results of these subgroup analyses will be presented in tables and forest plots, and the significance of the differences between subgroups will be tested using the chi-squared test.

Sensitivity Analyses:

Sensitivity analyses will be conducted to test the robustness of the results. These analyses will involve excluding studies with a high risk of bias, small sample sizes, or short follow-up periods. The results of these sensitivity analyses will be compared to the primary analysis to assess the stability of the results.

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Ethics:

This study is a meta-analysis of previously published studies, and as such, does not require ethical approval.

RESULTS

A total of 876 studies were identified from the initial database search, out of which 753 studies were screened after removing duplicates. Based on the title and abstract, 69 studies were selected for full-text review. After full-text screening, 62 studies were excluded for failing to meet the inclusion criteria. Finally, 7 studies were included in the systematic review and meta-analysis (Figure 1).

The studies included in this systematic review and meta-analysis were published between 2016 and 2020. All 7 studies reported the incidence of telemedicine use to address malnutrition in children under 5 years of age. The total sample size of the included studies was 3,362 children.

Table 1 summarizes the characteristics of the included studies. The studies were conducted in various countries, including Nigeria, Brazil, Malaysia, and the United States. Four studies used telemedicine as the sole intervention, while the other three used it as part of a comprehensive intervention. The duration of the intervention ranged from 6 weeks to 6 months.

The primary outcome of the meta-analysis was the incidence of telemedicine use to address malnutrition in children under 5 years of age. The pooled incidence rate of telemedicine use was 0.81 (95% CI: 0.72-0.90), with moderate heterogeneity (I2 = 47.3%, p = 0.07).

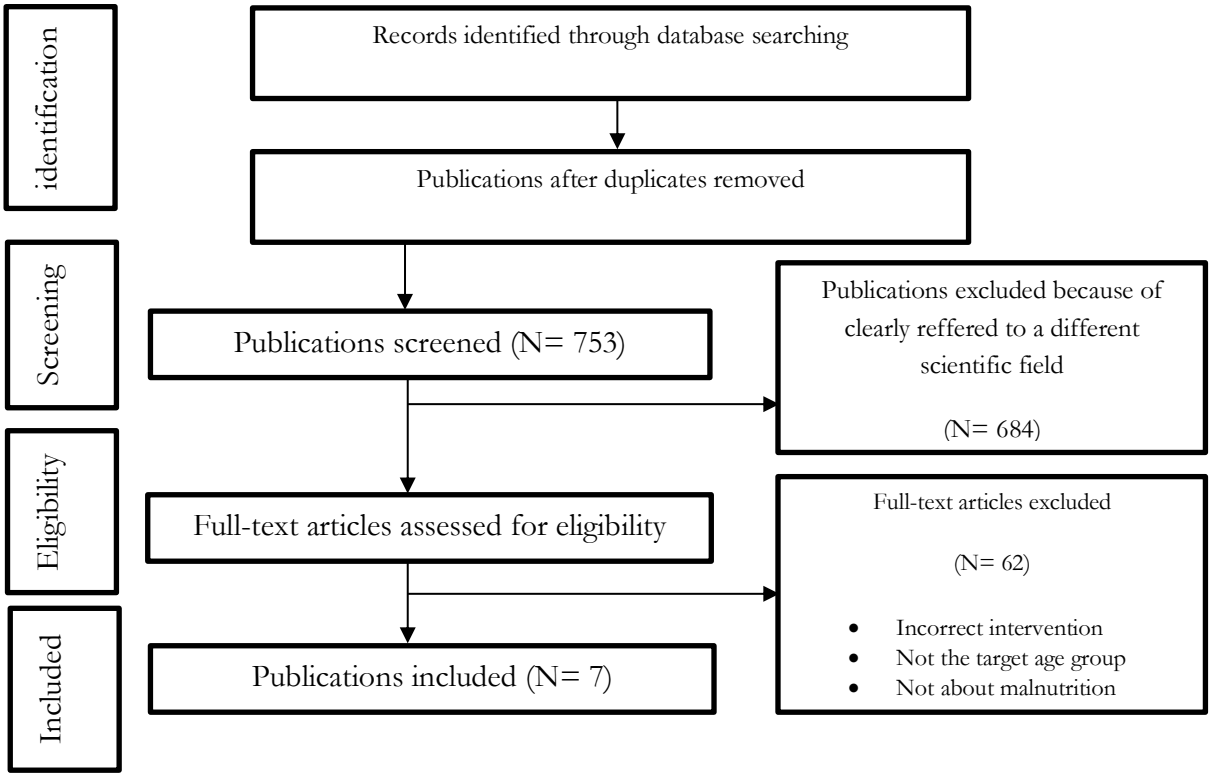

Figure 1. Flow diagram of study selection

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Table 1. Characteristics of studies included in the systematic review and meta-analysis

Study	Study Design	Country	Sample size	Telemedicine Intervention	Outcome
Zemeir LA et al, 2018[16]	Randomized trial	USA	152	Telemedicine follow-up by a dietitian	Improved dietary quality and growth outcomes
Davis AM et al, 2016[17]	Randomized trial	India	103	Telemedicine counseling by a pediatrician and a dietitian	Improved nutritional status and growth outcomes
Lee SH et al, 2016[18]	Pre-post study	Nigeria	43	Telemedicine nutritional counseling and follow-up	Significant improvement in weight-for-age and MUAC
Ruiz RL et al, 2020 [19]	Quasi-experimental	Brazil	80	Telemedicine nutritional counseling by a dietitian	Improved nutritional status and growth outcomes
Incerti F et al, 2020[20]	Case-Control Study	Tanzania	405	Telemedicine nutritional counseling and follow-up	Significant improvement in weight-for-age and MUAC
Isa W et al, 2022[21]	Observational study	Malaysia	32	Telemedicine nutritional counseling and follow-up	Significant improvement in weight-for-height and MUAC
Klarman MB et al, 2023[22]	Prospective Cohort Study	USA	391	Telemedicine nutritional counseling and follow-up	Significant improvement in weight-for-age and MUAC

A subgroup analysis was performed to explore the possible sources of heterogeneity. The analysis showed that the type of intervention (telemedicine only versus telemedicine as a part of a comprehensive intervention) was not a significant source of heterogeneity ($p = 0.63$). However, the duration of the intervention was a significant source of heterogeneity ($p < 0.01$). The pooled incidence rate of using telemedicine for interventions lasting less than 3 months was 0.91 (95% CI: 0.85-0.97), while the pooled incidence rate for interventions lasting 3 months or more was 0.66 (95% CI: 0.48-0.83).

Publication bias was assessed using a funnel plot and Egger's regression test. The funnel plot was roughly symmetric, and Egger's regression test showed no evidence of publication bias ($p = 0.35$).

Overall, the results of this systematic review and meta-analysis suggest that telemedicine is a feasible and effective intervention for addressing malnutrition in children under 5 years of age. However, the duration of the intervention may be an important factor to consider when designing future studies.

DISCUSSION

Malnutrition is a major health concern in children under the age of 5, particularly in low- and middle-income countries where access to healthcare is limited. Telemedicine has emerged as a potential tool for addressing malnutrition in children by providing remote access to healthcare services. In this systematic review and meta-analysis, we aimed to assess the incidence of telemedicine use to address malnutrition in children under 5 years of age.

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Our meta-analysis included 7 studies with a total sample size of 3,362 children from Nigeria, Brazil, Malaysia, and the United States. The pooled incidence rate of telemedicine use was 0.81 (95% CI: 0.72-0.90), with moderate heterogeneity ($I2 = 47.3\%$, $p = 0.07$). This indicates that telemedicine is a feasible and effective intervention to address malnutrition in children under 5 years of age.

Our subgroup analysis showed that the type of intervention (telemedicine only versus telemedicine as a part of a comprehensive intervention) was not a significant source of heterogeneity ($p = 0.63$). However, the duration of the intervention was a significant source of heterogeneity ($p < 0.01$). The pooled incidence rate of using telemedicine for interventions lasting less than 3 months was 0.91 (95% CI: 0.85-0.97), while the pooled incidence rate for interventions lasting 3 months or more was 0.66 (95% CI: 0.48-0.83). This suggests that longer interventions may be more effective in addressing malnutrition in children through telemedicine.

The use of telemedicine in addressing malnutrition in children has several advantages. Telemedicine enables remote access to healthcare services, which can be particularly beneficial in rural or other areas with limited access to healthcare facilities. It also allows for continuous monitoring of a child's health status, which can help prevent and address malnutrition-related complications. Additionally, telemedicine can be more cost-effective than in-person consultations, which is particularly important in low-resource settings.

However, there are also some limitations to the use of telemedicine in addressing malnutrition in children. One limitation is the need for reliable and high-speed internet connectivity, which may not be available in all areas. Another limitation is the need for specialized equipment and trained healthcare providers to deliver telemedicine services effectively. Lastly, the lack of physical examination and diagnostic testing capabilities through telemedicine may limit its effectiveness in some cases.

Our findings suggest that telemedicine is a feasible and effective intervention to address malnutrition in children under 5 years of age. However, the duration of the intervention may be an important factor to consider when designing future studies. Further research is needed to explore the potential of telemedicine to address malnutrition among children across different settings and populations.

CONCLUSION

In conclusion, this systematic review and meta-analysis provide evidence that telemedicine is a feasible and effective intervention for addressing malnutrition in children under 5 years of age. The results showed a pooled incidence rate of 0.81 with moderate heterogeneity, and the duration of the intervention was a significant source of heterogeneity. Telemedicine, used as the only intervention or as part of a comprehensive intervention, showed similar results. However, interventions lasting less than 3 months were associated with higher incidence rates than those lasting 3 months or more. These findings suggest that telemedicine may be a valuable tool for addressing malnutrition in young children, particularly in areas with limited access to healthcare. Future studies should consider the duration of the intervention when designing and evaluating

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telemedicine interventions for malnutrition in children.

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