Health system factors influencing adherence to the integrated management of newborn and childhood illness guidelines in the management of children below 5 years in Isiolo County, Kenya

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ABSTRACT

Adherence to the Integrated Management of Newborn and Childhood Illness (IMNCI) guidelines is essential for improving the quality of care provided to children under five years. However, adherence remains suboptimal in many resource-constrained healthcare settings. Evidence regarding the health system factors associated with IMNCI adherence in Isiolo County, Kenya, is limited. Guided by Donabedian's structure, process, outcome framework, this study assessed self-reported adherence and its association with health-system factors among healthcare workers managing children under five years in Isiolo County, Kenya. An analytical cross-sectional study was conducted in 12 purposively selected public health facilities. A sample of 190 clinical officers and nurses was selected using systematic random sampling following proportionate allocation across facilities. Data were collected using structured questionnaires and key informant interviews. Quantitative data were analysed using descriptive statistics, chi-square tests, and multivariable logistic regression. Associations were expressed as adjusted odds ratios (AORs) with 95% confidence intervals (CIs), with statistical significance set at $p < 0.05$. Of the 190 sampled healthcare workers, 155 completed the questionnaire, giving a response rate of 81.6%. Overall, 47.7% (n = 74) were classified as adherent to the IMNCI guidelines. In the adjusted analysis, higher daily under-five caseloads were associated with increased odds of adherence (AOR = 3.818; 95% CI: 1.450–10.056; $p = 0.007$). Healthcare workers reporting frequent supportive supervision had significantly higher odds of adherence than those receiving infrequent supervision (AOR = 8.403; 95% CI: 3.257–21.679; $p < 0.001$). Availability of IMNCI chart booklets and clinical staffing levels were not statistically significant in the adjusted model. Adherence to IMNCI guidelines among healthcare workers in Isiolo County was suboptimal. Supportive supervision and daily under-five caseload were independently associated with adherence, highlighting the importance of institutional support and service-delivery conditions in implementing IMNCI guidelines. The Isiolo County Department of Health should strengthen regular supportive supervision, improve monitoring of guideline adherence, and assess how patient caseload, staffing, and service organisation influence adherence across health facilities.

Keywords: IMNCI guidelines; adherence; health system factors; supportive supervision; under-five children; Isiolo County; Kenya.

I. INTRODUCTION

Despite substantial improvements in child survival over recent decades, preventable neonatal and childhood deaths remain a major public health challenge, particularly in low- and middle-income countries. According to the World Health Organization (WHO, 2026), approximately 4.9 million children died before reaching their fifth birthday in 2024, including 2.3 million newborns, who accounted for 47% of all under-five deaths. Sub-Saharan Africa and Southern Asia accounted for approximately 58% and 25% of these deaths, respectively. The global under-five mortality rate declined to 37.4 deaths per 1,000 live births in 2024, although sub-Saharan Africa continued to experience a substantially higher rate of 71.6 deaths per 1,000 live births. The leading causes of mortality included complications of prematurity, intrapartum-related events, pneumonia, diarrhoea and malaria, many of which are preventable or treatable through timely access to quality healthcare services. These persistent deaths underscore the importance of strengthening evidence-based child health interventions to achieve Sustainable Development Goal 3.2, which aims to reduce neonatal mortality to at least as low as 12 deaths per 1,000 live births and under-five mortality to at least as low as 25 deaths per 1,000 live births by 2030.

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The Integrated Management of Newborn and Childhood Illness (IMNCI) strategy is an important intervention for improving the quality of care provided to sick newborns and children under five years. Developed from the WHO and UNICEF Integrated Management of Childhood Illness (IMCI) approach, the strategy promotes comprehensive assessment, classification, treatment, caregiver counselling, and follow-up of common childhood illnesses. It recognises that children frequently present with multiple conditions requiring integrated rather than disease-specific management. However, adherence to IMNCI guidelines depends not only on healthcare workers' knowledge and clinical competencies but also on the health system conditions under which care is delivered. These include clinical staffing levels, daily under-five patient caseloads, availability of IMNCI chart booklets, essential medicines and supplies, presence of oral rehydration solution (ORS) corners, and supportive supervision. Adequate staffing and manageable workloads enable healthcare workers to undertake comprehensive assessments, while clinical job aids, essential commodities, and supportive supervision facilitate appropriate classification, treatment, and follow-up. Consequently, strengthening these health system components is essential for translating IMNCI recommendations into consistent clinical practice (Krüger et al., 2017; Reñosa et al., 2020).

Despite widespread adoption of IMCI, global evidence demonstrates considerable variation in its implementation and adherence to recommended clinical procedures. Boschi-Pinto et al. (2018), in a global cross-sectional survey involving 95 countries, established that only 44 countries (46%) reported full implementation of IMCI, defined by implementation of all three strategy components in at least 90% of districts. Full implementation was particularly limited among countries with high under-five mortality. Similarly, Reñosa et al. (2020), in a scoping review of 24 studies from different WHO regions, identified persistent challenges affecting healthcare workers' implementation of IMCI guidelines. The review established four major barriers: inadequate financial resources, insufficient training and supportive supervision, competing workload demands, and weaknesses in programme planning and coordination. Furthermore, 10 of the 24 studies reported incomplete or inconsistent assessment of sick children, with healthcare workers frequently omitting procedures not directly related to the presenting complaint. These findings demonstrate that policy adoption and geographical expansion of IMCI do not necessarily translate into consistent adherence at the point of care, particularly where health system support is inadequate.

Variations in adherence have also been demonstrated in multicountry and regional studies. Krüger et al. (2017), analysing nationally representative Service Provision Assessment survey data from Namibia, Kenya, Tanzania and Uganda, found substantial differences in healthcare workers' compliance with recommended childhood illness assessment procedures. Assessment of all three IMCI general danger signs ranged from 11% in Namibia and Kenya to 31% in Uganda, while assessment of the three main symptoms ranged from 34% in Kenya to 57% in Uganda. Adherence was generally higher among more qualified healthcare workers and those who had received recent IMCI retraining. Similarly, Kpoda et al. (2022), in a cross-sectional study involving 419 children attending 42 health facilities in Burkina Faso, reported an overall healthcare worker adherence score of 57.8%. The authors identified workload-related challenges in implementing recommended assessment procedures within the context of increased service demand. More recently, Tareke et al. (2024), using Ethiopia's 2021–2022 national service provision assessment data, reported 33% adherence to selected IMCI assessment procedures among children presenting with fever, cough, or diarrhoea. Although these studies used different adherence measures, their findings consistently demonstrate gaps in the application of recommended childhood illness management practices and highlight the contribution of healthcare worker and health system conditions.

The association between health system factors and IMNCI implementation has been further demonstrated in studies examining the availability of clinical resources, staffing, workload, and supervision. Belete et al. (2024), in an institutional mixed-methods study involving 417 healthcare workers in Northwest Ethiopia, reported an IMNCI utilisation rate of 63.1%. Healthcare workers who had received IMNCI training had significantly higher odds of utilisation than those without training (AOR = 3.13; 95% CI: 1.594–6.147). Similarly, consistent reference to the IMNCI chart booklet was positively associated with utilisation (AOR = 3.34; 95% CI: 1.99–5.60), whereas unavailability of recommended medicines was associated with reduced utilisation (AOR = 0.243; 95% CI: 0.128–0.464). The qualitative findings further identified shortages of equipment, inadequate supervision, and staffing challenges as barriers to implementation. These findings suggest that healthcare workers' adherence to recommended clinical practices is associated with the availability and organisation of essential health system resources. However, the relative importance of these factors may vary according to institutional capacity, patient volume and service-delivery arrangements.

In Kenya, IMNCI has been integrated into national child health policies and clinical guidelines to improve the management of common neonatal and childhood illnesses. Nevertheless, consistent implementation requires institutional arrangements that support healthcare workers in applying recommended procedures during routine clinical practice. Liambila et al. (2023), examining Kenya's experience in integrating the management of sick young infants with possible serious bacterial infection into national IMNCI guidelines, identified essential commodity availability, healthcare worker capacity development, and integration into county health workplans as important requirements for effective implementation. Strengthening provider knowledge through on-the-job training and incorporating essential commodities into county procurement plans contributed to improvements in the availability of medicines and the

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management of sick young infants. Similarly, Krüger et al. (2017) reported substantial gaps in adherence to IMCI assessment procedures in Kenya, with only 11% of consultations including assessment of all three general danger signs and 34% including assessment of all three main symptoms. Together, these findings highlight the importance of strengthening both healthcare worker competencies and institutional support systems to improve the quality and consistency of childhood illness management.

Kenya continues to experience a considerable burden of preventable neonatal and childhood mortality. The 2022 Kenya Demographic and Health Survey reported national neonatal and under-five mortality rates of 21 and 41 deaths per 1,000 live births, respectively, for the five years preceding the survey (Kenya National Bureau of Statistics [KNBS] & ICF, 2023). In Isiolo County, neonatal and under-five mortality rates were estimated at 22 and 33 deaths per 1,000 live births, respectively, based on the ten years preceding the survey. Although the national and county estimates represent different reference periods, the Isiolo estimates remain above the mortality targets established under Sustainable Development Goal 3.2. These findings underscore the continuing need to strengthen the quality of newborn and child healthcare services in the county. Effective implementation of IMNCI guidelines is particularly important within the county's predominantly arid and semi-arid context, where service delivery may be influenced by differences in facility capacity, healthcare worker availability, patient caseload, and access to essential clinical resources.

Donabedian's Structure–Process–Outcome framework provides a theoretical basis for understanding how health system conditions influence healthcare delivery processes and subsequent health outcomes (Donabedian, 1988). In this study, staffing levels, under-five patient caseloads, availability of IMNCI chart booklets, essential medicines and supplies, oral rehydration solution (ORS) corners, and supportive supervision are considered health system factors potentially associated with guideline adherence. Adherence is conceptualised as a measure of the care delivery process rather than a direct measure of child health outcomes. The study therefore sought to determine the level of adherence to IMNCI guidelines and examine its association with health system factors among healthcare workers managing children under five years in Isiolo County, Kenya.

1.1 Statement of the Problem

Despite the adoption of Integrated Management of Newborn and Childhood Illness (IMNCI) guidelines to improve the quality of care for children under five years, adherence to recommended clinical assessment and management procedures remains inconsistent across healthcare settings. In Isiolo County, the 2022 Kenya Demographic and Health Survey reported neonatal and under-five mortality rates of 22 and 33 deaths per 1,000 live births, respectively (Kenya National Bureau of Statistics [KNBS] & ICF, 2023). These mortality levels underscore the continuing need to strengthen the quality of newborn and child healthcare services. However, effective implementation of IMNCI guidelines depends on health system conditions, including adequate staffing, patient workload, availability of clinical job aids, essential medicines and supplies, oral rehydration solution (ORS) corners, and supportive supervision.

Although these factors have been examined in other healthcare settings, empirical evidence on the level of adherence to Integrated Management of Neonatal and Childhood Illness (IMNCI) guidelines and its association with health system factors in Isiolo County remains limited. Consequently, the extent to which these conditions are associated with healthcare workers' adherence to recommended clinical procedures has not been adequately established within the county. This evidence gap limits the ability of county health managers to identify and prioritise context-specific interventions for strengthening guideline implementation. Therefore, this study sought to determine the level of adherence to IMNCI guidelines and examine the health system factors associated with adherence among healthcare workers managing children under five years in Isiolo County, Kenya.

1.2 Objective of the Study

To determine the level of adherence to the Integrated Management of Newborn and Childhood Illness (IMNCI) guidelines and examine the association between health system factors and adherence among healthcare workers managing children under five years in Isiolo County, Kenya.

II. LITERATURE REVIEW

2.1 Theoretical Framework

2.1.1 Donabedian's Structure–Process–Outcome framework

The study was guided by Donabedian's Structure–Process–Outcome framework, which explains healthcare quality in relation to the conditions under which care is provided, the processes involved in service delivery and the resulting health outcomes (Donabedian, 1988). The framework identifies three interrelated components: structure, process and outcome. Structure encompasses the human, material and organisational resources available within healthcare facilities; process refers to the clinical activities undertaken in delivering care; while outcome represents the effects of healthcare services on patients' health. The framework proposes that adequate structural conditions increase the likelihood of appropriate care processes, which may subsequently contribute to improved health outcomes.

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In the context of this study, structural factors included clinical staffing levels, availability of IMNCI chart booklets, essential medicines and supplies, and oral rehydration solution (ORS) corners. Daily under-five patient caseload was considered a service-demand factor that may influence workload and the time available for comprehensive clinical assessment, while supportive supervision represented an organisational support process intended to strengthen adherence to recommended clinical procedures. Adherence to IMNCI guidelines was conceptualised as a care-delivery process reflected in healthcare workers' compliance with recommended assessment, classification, treatment, and counselling practices. Improved child health outcomes represent the intended downstream benefits of effective IMNCI implementation but were not directly measured in this study.

2.2 Empirical Review

Empirical evidence indicates that the implementation of Integrated Management of Childhood Illness (IMCI) guidelines (WHO, n.d.) remains uneven across healthcare systems, with substantial variation in adherence to recommended clinical procedures. Boschi-Pinto et al. (2018), in a global cross-sectional survey involving 95 countries, found that only 44 countries (46%) had implemented all three components of the IMCI strategy in at least 90% of their districts. Implementation was particularly limited in countries with high under-five mortality. Although the study demonstrated differences in the extent of programme implementation, its reliance on country-level reporting did not establish whether healthcare workers consistently followed recommended clinical procedures during patient consultations. Reñosa et al. (2020), in a scoping review of 24 studies conducted across several WHO regions, identified persistent implementation challenges, including inadequate financial resources, insufficient training and supervision, competing workload demands, and weaknesses in programme coordination. Ten of the reviewed studies reported incomplete clinical assessments, with healthcare workers frequently omitting procedures unrelated to the child's presenting complaint. These findings highlight the distinction between institutional adoption of IMCI and adherence during routine clinical practice, suggesting that programme expansion must be accompanied by adequate health system support.

The extent of variation in clinical adherence was further demonstrated by Krüger et al. (2017), who analysed nationally representative Service Provision Assessment data involving 6,856 children attended by 2,006 healthcare workers in Namibia, Kenya, Tanzania and Uganda. Assessment of all three IMCI general danger signs ranged from 11% in Namibia and Kenya to 31% in Uganda, while assessment of the three main symptoms ranged from 34% in Kenya to 57% in Uganda. Adherence was generally higher among more qualified healthcare workers and those who had received recent IMCI retraining. Similarly, Kpoda et al. (2022), in a secondary analysis of cross-sectional data involving 419 children attending 42 health facilities in Burkina Faso, reported an overall adherence score of 57.8%. More recently, Tareke et al. (2024), using Ethiopia's 2021–2022 national Service Provision Assessment data, reported 33% adherence to IMCI procedures for assessing children presenting with fever, cough, or diarrhoea. Their multilevel analysis identified facility type, healthcare provider qualifications, the child's age, and place of residence as significant factors associated with adherence. Although the studies used different adherence measures, they consistently demonstrated incomplete implementation of recommended assessment procedures. Their methodological differences, particularly the use of directly observed clinical practices and varying adherence indicators, also limit direct comparison of the reported adherence levels.

Human resource availability and patient workload have been identified as important institutional conditions affecting IMCI implementation. Oladokun et al. (2022), in a mixed-methods cross-sectional study among healthcare workers in selected primary healthcare centres in Ibadan, Nigeria, reported that 52.8% of respondents perceived inadequate numbers of trained personnel as a barrier to implementation. An equal proportion identified difficulties arising from insufficient trained staff relative to the number of children seeking care. Similarly, Abebe et al. (2019), in a facility-based study involving 201 healthcare professionals in Ethiopia, found that 16.4% reported staff shortages, while 33.0% identified the time required to implement IMNCI procedures as an implementation challenge. These findings suggest that staffing and workload pressures may constrain healthcare workers' ability to undertake comprehensive clinical assessments. However, the studies primarily measured perceived implementation barriers, making it difficult to establish the independent contribution of staffing levels and patient caseload to actual adherence. Furthermore, the relationship between caseload and adherence may depend on staffing adequacy, professional experience and facility organisation, indicating the need to examine these factors within specific healthcare settings.

The availability and utilisation of IMNCI chart booklets constitute another important dimension of health system readiness. Belete et al. (2024), in an institutional mixed-methods study involving 417 healthcare workers in Northwest Ethiopia, reported an overall IMNCI utilisation level of 63.1%. Multivariable logistic regression demonstrated that the absence of IMNCI chart booklets was associated with lower odds of utilisation (AOR = 0.299; 95% CI: 0.156–0.571). Healthcare workers who consistently referred to the chart booklet during case management had higher odds of utilisation than those who did not (AOR = 3.34; 95% CI: 1.99–5.60). These findings indicate that clinical job aids may support the application of recommended assessment, classification, and treatment procedures. Nevertheless, the distinction between the availability of chart booklets and their actual utilisation is important, as physical access does not necessarily

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guarantee consistent reference during patient management. The cross-sectional design also limits causal interpretation of the observed relationships.

The availability of essential medicines and medical supplies has similarly been associated with IMNCI implementation. Belete et al. (2024) found that the absence of recommended medicines was associated with substantially lower odds of IMNCI utilisation (AOR = 0.243; 95% CI: 0.128–0.464). In Ethiopia, Abebe et al. (2019) reported that 37.3% of healthcare workers identified inadequate supplies as a challenge to implementing IMNCI guidelines. These findings suggest that interruptions in the availability of essential commodities may limit healthcare workers' ability to provide recommended treatment even when appropriate assessments and classifications are undertaken. In Kenya, Liambila et al. (2023) examined the institutionalisation of revised IMNCI guidelines for managing sick young infants with possible serious bacterial infection. The implementation programme incorporated commodity forecasting, procurement planning and provider capacity development within county health systems. During implementation, the average number of stock-out days for amoxicillin dispersible tablets in participating dispensaries decreased from 204 to 18 days between the reported assessment periods. Although this improvement occurred alongside several programme and health system interventions, the findings illustrate the importance of integrating essential commodities into routine institutional planning. The contribution of oral rehydration solution (ORS) corners, as a specific facility resource, remains less clearly established in the reviewed evidence, warranting examination alongside other resource indicators.

Supportive supervision represents an additional organisational factor associated with the implementation of IMNCI guidelines. Reñosa et al. (2020) identified inadequate mentoring and supervision among the major challenges affecting IMCI implementation across healthcare settings. Similarly, Abebe et al. (2019) found that 27.4% of healthcare workers reported inadequate supervision as an implementation barrier, while only 10.9% had received follow-up training. Belete et al. (2024) also identified inadequate supervision among the challenges reported by healthcare workers, alongside shortages of equipment, medicines, and trained personnel. Collectively, these findings suggest that supportive supervision may strengthen implementation by facilitating continuous professional guidance, reinforcing recommended clinical practices and identifying operational constraints. However, much of the available evidence derives from cross-sectional assessments and perceived barriers, which do not adequately establish whether supervision independently predicts adherence after accounting for other health system characteristics. Examining supervision alongside staffing, caseload, and resource availability is therefore important for understanding its association with guideline adherence.

Kenyan evidence further demonstrates the importance of integrating IMNCI implementation into routine health system processes. Krüger et al. (2017), using nationally representative survey data, documented low adherence to essential childhood illness assessment procedures, with only 11% of consultations involving assessment of all three general danger signs and 34% involving assessment of all three main symptoms. These findings established substantial gaps in the application of IMCI guidelines despite their adoption within the healthcare system. Liambila et al. (2023) subsequently demonstrated the feasibility of strengthening IMNCI implementation through county-level planning, improved commodity management, on-the-job training, and quality improvement activities. Their implementation research showed improvements in the availability of essential medicines and the management of sick young infants following the integration of revised clinical guidelines into routine service delivery. However, the study focused specifically on the management of sick young infants with possible serious bacterial infection and did not quantify the independent associations between the broader set of health system factors and adherence to IMNCI guidelines among healthcare workers managing all children under five years. Consequently, the available Kenyan evidence provides important insights into implementation challenges but leaves gaps regarding the relative association of specific institutional conditions with guideline adherence across different county health systems.

Overall, the reviewed evidence demonstrates that adherence to IMCI and IMNCI guidelines varies considerably across healthcare settings and is associated with a combination of healthcare worker characteristics, resource availability and organisational support. Studies have identified staffing shortages, patient workload, and limited access to chart booklets, inadequate medicines and supplies, and insufficient supportive supervision as important implementation challenges. However, the strength and direction of these relationships are not uniform, partly because studies differ in their populations, adherence measures, research designs and analytical approaches. In particular, some investigations have measured directly observed clinical adherence, while others have assessed self-reported utilisation or perceived implementation barriers, limiting comparability. Furthermore, evidence examining these factors collectively within Kenyan county health systems remains limited. This study therefore sought to address the contextual evidence gap by determining the level of adherence to IMNCI guidelines and examining its association with clinical staffing levels, daily under-five caseloads, IMNCI chart booklet availability, essential medicines and supplies, ORS corner availability, and supportive supervision among healthcare workers in Isiolo County, Kenya.

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III. METHODOLOGY

3.1 Research Design

An analytical cross-sectional study design incorporating quantitative and qualitative data collection methods was employed. Quantitative data were collected from clinical officers and nurses to determine their level of adherence to the Integrated Management of Newborn and Childhood Illness (IMNCI) guidelines and examine associations between adherence and selected health system factors. Qualitative information was obtained through key informant interviews with facility in-charges to provide additional insights into the institutional conditions affecting guideline implementation. The cross-sectional design enabled the assessment of adherence and associated factors during the study period.

3.2 Study Location

The study was conducted in 12 selected public health facilities in Isiolo County, Kenya. Isiolo County is located in northern Kenya and is predominantly arid and semi-arid, covering approximately 25,336 km². The county's public healthcare system provides preventive, promotive, and curative services, including outpatient management of children less than five years. The selected facilities provided an appropriate setting for examining adherence to IMNCI guidelines because clinical officers and nurses routinely assess and manage childhood illnesses within these facilities.

3.3 Study Population

The target population comprised clinical officers and nurses involved in the assessment and management of children under five years in public health facilities in Isiolo County. These healthcare professionals were selected because they are directly responsible for implementing IMNCI guidelines during routine clinical consultations. Facility in-charges were included as key informants to provide institutional perspectives on staffing, patient workload, clinical resources, and supportive supervision.

3.4 Sampling Technique

A multistage sampling approach was employed. In the first stage, 12 public health facilities were purposively selected, taking into consideration the availability of eligible healthcare workers during the data collection period. In the second stage, the required number of clinical officers and nurses was allocated proportionately across the selected facilities according to their respective populations of eligible healthcare workers. Systematic random sampling was then employed to select participants from staff lists obtained from the relevant human resource departments. A random starting position was selected, after which eligible healthcare workers were identified at a predetermined sampling interval until the allocated sample was attained. All 12 facility in-charges were selected for key informant interviews.

3.5 Sample Size

The sample size was determined using the Fisher *et al.* (1991) sample size determination approach, as documented in the original study methodology. The required sample was 190 clinical officers and nurses. The sample was allocated proportionately across the 12 selected health facilities according to the number of eligible healthcare workers in each facility. Of the 190 questionnaires distributed, 155 were completed and returned, representing a response rate of 81.6%. The 155 completed questionnaires constituted the quantitative dataset used for analysis.

3.6 Inclusion and Exclusion Criteria

The study included clinical officers and nurses working in the selected public health facilities who were involved in providing clinical services to children under five years during the study period. Healthcare workers from other professional cadres and personnel who were not involved in the clinical management of under-five children were excluded from the quantitative study population. Facility in-charges were eligible for the qualitative component because of their responsibility for supervising service delivery and managing institutional resources.

3.7 Data Collection

Data were collected using a pretested structured questionnaire and a key informant interview guide. The questionnaire obtained information on healthcare workers' characteristics, adherence to IMNCI guidelines, and the health system factors under investigation. Adherence was assessed using 20 items addressing the frequency with which healthcare workers undertook recommended IMNCI care procedures. The health system variables included clinical staffing levels, daily under-five patient caseload, availability of IMNCI chart booklets, essential medicines and supplies, presence of oral rehydration solution (ORS) corners, and frequency of supportive supervision. Key informant interviews with facility in-charges were intended to provide complementary information on institutional resources and operational challenges affecting IMNCI implementation.

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3.8 Validity and Reliability

A structured questionnaire and key informant interview guide were developed, pretested, and validated before data collection. Pretesting was undertaken to assess the clarity, relevance, and comprehensibility of the data collection items and their suitability for the study population. The questionnaire items were aligned with the study objectives and the selected health system variables. The adherence assessment incorporated 20 items reflecting recommended IMNCI care procedures. The specific procedures used to establish instrument validity and internal consistency reliability require confirmation from the original instrument development and pretesting records.

3.9 Data Analysis

SPSS Version 27 was used to analyse data. Descriptive statistics, including frequencies and percentages, were used to summarise respondents' adherence levels and the distribution of health system factors. Adherence was assessed using 20 IMNCI care items measured on a four-point Likert scale ranging from 1 (Never), 2 (Rarely), 3 (Often), to 4 (Always). Responses were categorised into infrequent practice (Never/Rarely) and frequent practice (Often/Always). A composite adherence measure was used to classify respondents as adherent or non-adherent for subsequent statistical analysis.

Pearson's chi-square test was used to examine bivariate associations between the selected health system variables and adherence status. Variables demonstrating statistically significant associations at the bivariate level were considered for inclusion in a multivariable binary logistic regression model. The fitted model included IMNCI chart booklet availability, clinical staffing levels, daily under-five patient caseload, and supportive supervision frequency. Associations were expressed as adjusted odds ratios (AORs) with corresponding 95% confidence intervals (CIs). Statistical significance was determined at $p < 0.05$.

The multivariable logistic regression model was expressed as:

$$\text{Log}\left[p / (1 - p)\right] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$$

Where p represents the probability of adherence to IMNCI guidelines, β_0 is the intercept, and β_1 to β_4 are regression coefficients corresponding to chart booklet availability, clinical staffing levels, under-five patient caseload, and supportive supervision, respectively.

Qualitative data obtained through key informant interviews were analysed using inductive thematic analysis to identify recurring themes relating to health system resources and guideline implementation.

3.10 Ethical Considerations

Ethical approval was obtained from the Meru University Institutional Research and Ethics Review Committee (MIRERC No. 054/2024). A research licence was also obtained from the National Commission for Science, Technology and Innovation (NACOSTI Licence No: NACOSTI/P/25/415898). Data collection was conducted under these research authorisations. The procedures used for obtaining informed consent, protecting participant confidentiality, and securing the collected data should be reported in accordance with the approved study protocol.

IV. RESULTS & DISCUSSION

4.1 Results

Of the 190 questionnaires distributed to clinical officers and nurses, 155 were completed and returned, giving a response rate of 81.6%. The results are presented according to the two study objectives: determining the level of adherence to Integrated Management of Newborn and Childhood Illness (IMNCI) guidelines and examining the associations between selected health system factors and adherence.

4.1.1 Level of adherence to IMNCI guidelines

Adherence to IMNCI guidelines was assessed using self-reported responses to 20 recommended care-step items. Of the 155 healthcare workers surveyed, 74 (47.7%) were classified as adherent, while 81 (52.3%) were non-adherent (Figure 1). These findings indicate that fewer than half of the respondents met the study's adherence criteria.

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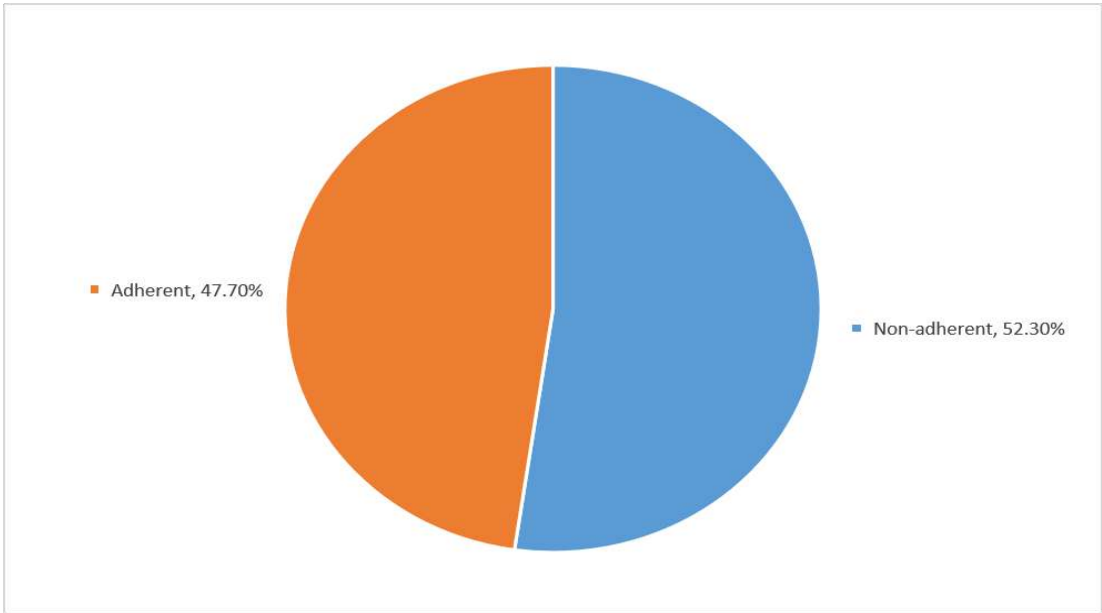


Figure 1
Distribution of Self-Reported Adherence to IMNCI Guidelines among Healthcare Workers (n = 155).

4.1.2 Distribution of health system factors

Table 1 presents the distribution of the six health system factors assessed among healthcare workers in Isiolo County, including clinical staffing levels, daily under-five patient caseload, availability of IMNCI chart booklets, essential medicines and supplies, presence of oral rehydration solution (ORS) corners, and frequency of supportive supervision.

Table 1
Distribution of health system characteristics reported by participants (n = 155)

Health system characteristic	Response category	n	%
IMNCI chart booklet available	No	38	24.50%
	Yes	117	75.50%
Clinical officers/nurses count	1–5	42	27.10%
	6–10	6	3.90%
	11–20	33	21.30%
	>20	74	47.70%
Daily under-five patient caseload	<20	84	54.20%
	20–39	41	26.50%
	40–59	15	9.70%
	60–79	12	7.70%
	≥80	3	1.90%
IMNCI medicines and supplies available	Never	0	0.00%
	Rarely	6	3.90%
	Often	81	52.30%
	Always	68	43.90%
ORS corner available	No	65	41.90%
	Yes	90	58.10%
Supportive supervision frequency	Never	18	11.60%
	Rarely	68	43.90%
	Often	63	40.60%
	Always	6	3.90%

IMNCI chart booklets were reported as available by 117 respondents (75.5%). The reported number of clinical officers and nurses in respondents' service settings ranged from 1–5 for 42 respondents (27.1%) to more than 20 for 74 (47.7%). Daily under-five caseloads were below 20 for 84 respondents (54.2%), while 41 (26.5%) reported 20–39 cases, 15 (9.7%) reported 40–59, 12 (7.7%) reported 60–79, and three (1.9%) reported 80 or more.

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IMNCI medicines and supplies were reported as often available by 81 respondents (52.3%) and always available by 68 (43.9%). Ninety respondents (58.1%) reported the presence of an oral rehydration solution (ORS) corner, while 65 (41.9%) reported its absence. Supportive supervision was reported as never occurring by 18 respondents (11.6%), rarely by 68 (43.9%), often by 63 (40.6%), and always by six (3.9%). In total, 86 respondents (55.5%) reported absent or rare supervision.

4.1.3 Bivariate associations between health system factors and adherence

Pearson's chi-square test was used to assess the association between the six health system factors and adherence to IMNCI guidelines among healthcare workers in Isiolo County. The findings are presented in Table 2.

Table 2

Bivariate associations between health system characteristics and IMNCI adherence

Health system characteristic	Category	Non-adherent n (%)	Adherent n (%)	p-value
IMNCI chart booklet available	No	27 (71.1%)	11 (28.9%)	0.008
	Yes	54 (46.2%)	63 (53.8%)	
Clinical officers/nurses count	≤10	24 (50.0%)	24 (50.0%)	0.025
	11–20	24 (72.7%)	9 (27.3%)	
	>20	33 (44.6%)	41 (55.4%)	
Daily under-five patient caseload	<20	51 (60.7%)	33 (39.3%)	0.001
	≥20 (reported)	12 (29.3%)	29 (70.7%)	
IMNCI medicines and supplies available	No	3 (50.0%)	3 (50.0%)	0.910
	Yes	78 (52.3%)	71 (47.7%)	
ORS corner available	No	39 (60.0%)	26 (40.0%)	0.101
	Yes	42 (46.7%)	48 (53.3%)	
Supportive supervision frequency	Never/rarely	60 (69.8%)	26 (30.2%)	<0.001
	Often/always	21 (30.4%)	48 (69.6%)	

Availability of IMNCI chart booklets was significantly associated with adherence to the guidelines (p = 0.008). Among healthcare workers with access to chart booklets, 53.8% (n = 63) were adherent, compared with 28.9% (n = 11) of those without access. Clinical staffing levels were also significantly associated with adherence (p = 0.025), with adherence ranging from 27.3% among respondents in facilities with 11–20 clinical staff to 55.4% among those in facilities with more than 20 clinical staff.

Daily under-five patient caseload was significantly associated with adherence (p = 0.001). Among respondents included in the reported caseload comparison, adherence was higher in the group managing 20–39 under-five cases daily (70.7%, n = 29) than in the group managing fewer than 20 cases (39.3%, n = 33). Supportive supervision was similarly associated with adherence (p < 0.001), with 69.6% of respondents receiving frequent supervision reporting adherence, compared with 30.2% of those receiving infrequent supervision. Conversely, neither the availability of IMNCI commodities (p = 0.910) nor the presence of an oral rehydration solution (ORS) corner (p = 0.101) demonstrated a statistically significant association with adherence.

4.1.4 Multivariable logistic regression analysis

Multivariable binary logistic regression analysis was conducted to determine the independent associations between health system factors and adherence to IMNCI guidelines. The variables included in the model were IMNCI chart booklet availability, clinical staffing levels, daily under-five patient caseload, and supportive supervision frequency. The results are presented in Table 3 as adjusted odds ratios (AORs) with corresponding 95% confidence intervals (CIs).

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Table 3

Multivariable logistic regression of health system factors associated with IMNCI adherence

Predictor (reported comparison)	B	SE	Wald χ^2	AOR	95% CI	p-value
IMNCI booklet available (yes vs no)	-0.177	0.559	0.101	0.837	0.280–2.504	0.751
Clinical staffing (>20 vs <20)	0.632	0.538	1.379	1.881	0.655–5.401	0.240
Daily under-five caseload (>20 vs <20)	1.34	0.494	7.355	3.818	1.450–10.056	0.007
Supportive supervision (frequent vs rare)	2.129	0.484	19.378	8.403	3.257–21.679	<0.001
Constant	-1.437	0.725	3.927	0.238	—	0.048

After adjusting for other variables in the model, daily under-five patient caseload was significantly associated with adherence to IMNCI guidelines (AOR = 3.818; 95% CI: 1.450–10.056; p = 0.007). Healthcare workers managing higher daily patient caseloads had approximately 3.8 times greater odds of adherence compared with those managing lower caseloads. Supportive supervision was also significantly associated with adherence (AOR = 8.403; 95% CI: 3.257–21.679; p < 0.001), with healthcare workers receiving frequent supervision demonstrating approximately 8.4 times greater odds of adherence than those receiving infrequent supervision.

In contrast, IMNCI chart booklet availability (AOR = 0.837; 95% CI: 0.280–2.504; p = 0.751) and clinical staffing levels (AOR = 1.881; 95% CI: 0.655–5.401; p = 0.240) were not significantly associated with adherence after adjustment for other variables. The regression model yielded a Nagelkerke R^2 of 0.425 and an overall classification accuracy of 76.0%.

4.2 Discussion

This study examined the level of adherence to Integrated Management of Newborn and Childhood Illness (IMNCI) guidelines and its association with selected health system factors among healthcare workers in Isiolo County, Kenya. The findings revealed that 47.7% of healthcare workers adhered to the guidelines, while 52.3% were classified as non-adherent. Daily under-five patient caseload and supportive supervision were significantly associated with adherence in the multivariable analysis. Although IMNCI chart booklet availability and clinical staffing levels demonstrated significant associations in the bivariate analysis, these associations were not statistically significant after adjustment for other factors. The findings highlight the importance of organisational and service delivery conditions in supporting the implementation of IMNCI guidelines.

The adherence level of 47.7% indicates that fewer than half of the healthcare workers consistently reported undertaking the recommended IMNCI care procedures. This finding is consistent with evidence from other sub-Saharan African countries demonstrating gaps in the implementation of childhood illness management guidelines. Krüger et al. (2017), in a multicountry analysis involving Kenya, Namibia, Tanzania and Uganda, found substantial variations in adherence to recommended clinical assessment procedures. In Kenya, only 11% of observed consultations included assessment of all three general danger signs, while 34% included assessment of the three main symptoms. Similarly, Kpoda et al. (2022), in Burkina Faso, reported an overall IMCI adherence score of 57.8%, demonstrating incomplete implementation of recommended clinical practices. In Ethiopia, Tareke et al. (2024) reported 33% adherence to IMCI assessment procedures, while Belete et al. (2024) found an IMNCI protocol utilisation level of 63.1% among healthcare workers. Although these studies employed different approaches to measuring adherence and utilisation, their findings demonstrate that consistent implementation of childhood illness management guidelines remains a challenge across healthcare systems. The findings from Isiolo County therefore reinforce the need for sustained efforts to strengthen the quality and consistency of childhood illness management within routine healthcare services.

Supportive supervision emerged as the strongest factor associated with adherence to IMNCI guidelines. Healthcare workers receiving frequent supportive supervision had approximately 8.4 times higher adjusted odds of adherence compared with those receiving infrequent supervision (AOR = 8.403; 95% CI: 3.257–21.679; p < 0.001). This finding suggests that regular supervisory engagement is an important organisational condition associated with the consistent application of recommended clinical procedures. Supportive supervision may provide opportunities for reinforcing clinical knowledge, reviewing case management practices, identifying performance gaps, and providing feedback to healthcare workers. The finding is consistent with Reñosa et al. (2020), whose scoping review identified inadequate mentoring and supervision among the major challenges affecting IMCI implementation. Similarly, Belete et al. (2024) reported insufficient supportive supervision as an important implementation challenge in Ethiopia, with healthcare workers indicating that limited managerial follow-up affected the routine application of IMNCI protocols. These findings suggest that supportive supervision should extend beyond administrative oversight to incorporate practical clinical mentorship, structured feedback, and continuous quality improvement. Within Isiolo County,

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strengthening routine supportive supervision may therefore provide an important opportunity to reinforce adherence to IMNCI guidelines.

Daily under-five patient caseload was also significantly associated with adherence to IMNCI guidelines (AOR = 3.818; 95% CI: 1.450–10.056; p = 0.007). Healthcare workers managing higher daily patient caseloads demonstrated approximately 3.8 times higher adjusted odds of adherence compared with those managing lower caseloads. This finding is notable because high patient workload is frequently identified as a barrier to comprehensive implementation of childhood illness management guidelines. Reñosa et al. (2020) reported that the time required to undertake complete IMCI assessments often conflicts with competing service delivery demands, particularly in busy primary healthcare settings. The positive association observed in the present study may reflect greater familiarity with IMNCI procedures among healthcare workers who regularly manage childhood illnesses. It is also possible that higher-volume service delivery settings benefit from more established clinical routines, professional experience, or organisational support. However, these explanations require further investigation, as patient caseload alone does not necessarily reflect the workload experienced by an individual healthcare worker. The findings suggest that opportunities for frequent clinical practice and the organisation of under-five services may be important considerations when strengthening guideline adherence.

Availability of IMNCI chart booklets was significantly associated with adherence in the bivariate analysis (p = 0.008), with adherence reported by 53.8% of healthcare workers who had access to chart booklets compared with 28.9% of those without access. However, this association was not statistically significant after adjusting for other health system factors (AOR = 0.837; 95% CI: 0.280–2.504; p = 0.751). This finding suggests that although clinical reference materials may support guideline implementation, their availability alone may not independently explain adherence when other institutional factors are considered. In contrast, Belete et al. (2024) found that healthcare workers who consistently referred to IMNCI chart booklets during case management had significantly higher odds of protocol utilisation (AOR = 3.34; 95% CI: 1.99–5.60). The difference between these findings may relate to the distinction between the physical availability of chart booklets and their actual utilisation during clinical consultations. Consequently, ensuring access to current IMNCI reference materials should be complemented by practical guidance on their consistent application during patient assessment and management.

Clinical staffing levels were significantly associated with adherence in the bivariate analysis (p = 0.025), but the association was not statistically significant in the multivariable model (AOR = 1.881; 95% CI: 0.655–5.401; p = 0.240). This indicates that the observed differences in adherence across staffing categories did not remain statistically significant after accounting for the other variables included in the model. The finding differs from evidence identifying inadequate staffing as an important barrier to IMNCI implementation. Reñosa et al. (2020) highlighted the challenges arising from competing clinical responsibilities and limited human resources, while Belete et al. (2024) identified high patient-to-provider ratios and staff turnover among reported implementation constraints. The findings from Isiolo County suggest that the relationship between staffing and guideline adherence may be more complex than the total number of clinical personnel available. Staff deployment, professional competencies, allocation of responsibilities and the organisation of under-five services may also influence the ability of healthcare workers to follow recommended procedures. Therefore, strengthening adherence may require attention not only to staff numbers but also to the effective organisation and supervision of clinical services.

The availability of essential IMNCI medicines and supplies was not significantly associated with adherence in the bivariate analysis (p = 0.910). Most respondents (96.1%) reported that the required commodities were often or always available, indicating relatively limited variation in reported availability across the study population. This may partly explain the absence of a statistically significant association. The finding contrasts with Belete et al. (2024), who reported that the absence of recommended medicines was associated with substantially lower odds of IMNCI protocol utilisation (AOR = 0.243; 95% CI: 0.128–0.464). In Kenya, Liambila et al. (2023) demonstrated the importance of integrating essential commodity forecasting and procurement into county health planning when institutionalising updated IMNCI guidelines for sick young infants. The findings from Isiolo County do not diminish the importance of essential medicines and supplies but indicate that reported commodity availability was not associated with differences in adherence within the study population. Maintaining reliable supplies remains necessary for translating appropriate clinical assessment and classification into recommended treatment.

Similarly, the presence of oral rehydration solution (ORS) corners was not significantly associated with adherence to IMNCI guidelines (p = 0.101). Although 58.1% of respondents reported the presence of ORS corners in their service settings, their availability did not demonstrate a statistically significant association with the overall adherence measure. ORS corners remain relevant to the management of childhood diarrhoeal illnesses, particularly in facilitating timely oral rehydration and caregiver education. However, overall adherence to IMNCI guidelines encompasses a wider range of clinical activities, including assessment, classification, treatment and counselling for different childhood illnesses. Consequently, the contribution of ORS corners may be more directly reflected in adherence to diarrhoea-specific management procedures than in a composite measure of overall IMNCI adherence.

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Further assessment of disease-specific clinical practices may provide additional insights into the relationship between ORS corner availability and the quality of childhood diarrhoea management.

Taken together, the findings are consistent with Donabedian's Structure–Process–Outcome framework, which recognises the relationship between healthcare system conditions and the quality-of-care delivery (Donabedian, 1988). In the present study, structural factors such as staffing levels, clinical reference materials and essential commodities were examined alongside organisational support and patient caseload in relation to adherence as a care-delivery process. The stronger adjusted associations observed for supportive supervision and patient caseload suggest that the effective organisation and support of clinical practice may be particularly important for implementing IMNCI guidelines. These findings reinforce the need for integrated health system interventions that combine reliable clinical resources with supervision, professional development and effective service organisation.

The study provides context-specific evidence on health system factors associated with IMNCI adherence in Isiolo County. However, adherence was assessed through healthcare workers' self-reports, which may differ from practices observed during actual clinical consultations. Additionally, the cross-sectional design does not establish causal relationships, while the selection of 12 public health facilities limits the extent to which findings can be generalised to other healthcare settings. Nevertheless, the study identifies supportive supervision and daily under-five caseload as important factors associated with adherence and provides evidence to inform county-level strategies for strengthening IMNCI implementation. Particular emphasis on routine clinical mentorship, performance feedback and effective organisation of under-five services may contribute to improving the consistency of guideline-based childhood illness management.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The study established that adherence to IMNCI guidelines among healthcare workers in Isiolo County was suboptimal, with only 47.7% demonstrating adherence. Supportive supervision and daily under-five patient caseload were significantly associated with adherence, while staffing levels and IMNCI chart booklet availability were not significant after adjustment. These findings highlight the importance of strengthening clinical supervision and improving the organisation of under-five healthcare services to promote consistent guideline implementation.

5.2 Recommendations

The Isiolo County Department of Health should strengthen routine supportive supervision through clinical mentorship, case reviews and regular performance feedback. Health facilities should optimise workload distribution, provide continuous IMNCI training and ensure the availability of updated chart booklets, essential medicines and functional ORS corners. Regular clinical audits should be conducted to monitor adherence and guide quality improvement. Further studies incorporating direct observation of clinical practice are recommended to validate adherence levels and assess the effectiveness of these interventions.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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