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Skin Grafting using Pelege skin fish

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Contents

Integrated Disease Surveillance and Response (IDSR): Cumulative report for three months, July – December, 2025 (Epidemiological week 27-52)

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ABSTRACT

Introduction: The Tanzanian Ministry of Health (MoH) continues to implement surveillance of reportable diseases and conditions through the Integrated Disease Surveillance and Response (IDSR) system. IDSR data are electronically captured and submitted to the MoH on a regular basis. The primary aim of IDSR is to provide a rational basis for decision-making and to support implementation of effective public health interventions targeting priority communicable diseases. This paper presents cumulative data captured and reported to MoH over a six-month period, from January to June 2015, corresponding to the World Health Organization (WHO) epidemiological weeks 27-52.

Methodology: Data were extracted from the IDSR system and analyzed to assess both regional and national performance in terms of timeliness and completeness of reporting disaggregated by months and regions. Performance was assessed based on the set national standard of ≥ 90% for both indicators. In addition, the analysis examined the cumulative number of reported cases and deaths, as well as their distribution by months and regions.

Results: All 26 regions of Tanzania Mainland submitted weekly reports to the national level, achieving an overall average completeness of 97.2% across all months, meeting the national target of of ≥ 90%. However, the overall average timeliness was 88.1% below the national standard of ≥ 90%. The national completeness and timeliness targets were met in all weeks except epidemiological weeks 44 and 52, and week 27 for timeliness. Cumulatively, a total of 346,739 cases and 31 deaths were reported for all IDSR immediate reportable diseases and conditions. The most commonly reported condition was diarrheal diseases, accounting for 51.8% (179,725) of all cases and reported from all 26 regions, with the highest number in Morogoro (15,516; 8.6%). Morogoro region also reported high number of typhoid (3,946;13.0%) and dengue fever (740; 8.6%) reported across all regions. Overall, more cases were reported in quarter 3 (July-September) with 184,150 (53.1%) cases compared to quarter 4 (October-December). Of the 31 reported deaths, the majority were caused by cholera (n=19; 61.3%). Suspected cholera had the highest case fatality rate (CFR), with 19 deaths out of 554 suspected cases, resulting in a CFR of 3.4%.

Conclusion: The IDSR data for July to December 2025 (WHO epidemiological weeks 27-52) indicated that the reporting completeness remained high and met the national standard of ≥90%. However, reporting timeliness fell below the set national target, with a notable decline in October. This drop may have been influenced by disruption associated with general election held in October 2025. It should be noted that delays in reporting can hinder early detection of outbreaks and public health response. Hence, there is a need of strengthening contingency plans and ensuring continuity of surveillance activities during national events and other disruptions are therefore critical for maintaining system resilience and protecting public health. Diarrheal diseases remained the leading conditions during the reporting period, while suspected cholera cases recorded a high fatality rate. This underscores the need for the government to introduce additional measures and reinforce existing preventive and control strategies for diarrheal diseases.

Keywords: Integrated Disease Surveillance and Response, WHO Epidemiological Week 27-25, 2025, Tanzania

INTRODUCTION

In Tanzania, surveillance for reportable diseases and conditions under the Integrated Disease Surveillances and Response (IDSR) system are electronically collected and published through weekly and monthly reports of the Ministry of Health (MoH). The IDSR serves as a strategic framework for multi-disease surveillance of selected priority diseases or conditions, integrating data collection and response across the community, health facility, district and national levels. Its primary goal is to provide timely and actionable information for helping public health managers and decision-makers in improving detection of and response to major causes of morbidity, mortality and disability

in African countries. The paper presents cumulative IDSR data collected over a six-month period from July to December 2025, corresponding to WHO Epidemiological Weeks 27 to 52.

METHODOLOGY

Data were extracted from IDSR system, which is derived from the DHSI2 platform, then cleaned and analyzed using SPSS version 24. The analysis focused on two key WHO indicators: timeliness and completeness, which were used to assess overall, monthly and regional performance of the surveillance system. In this study, timeliness refers to the proportion of all expected IDSR summary reports (weekly or monthly) that were submitted to the national database by the due date. Completeness refers to the proportion of all expected IDSR summary reports (weekly or monthly) that were submitted to the national database, regardless of the submission date. Performance was assessed based on the set national standard of ≥ 90% for both indicators. In addition, the analysis examined the cumulative number of reported cases and deaths, as well as their distribution by months and regions. The probability of specific infections or conditions resulting in death (case fatality rate, CFR) was also calculated.

RESULTS

Health Facility Performance

All 26 regions of Tanzania Mainland submitted weekly reports of selected priority reportable conditions to the national level through the IDSR system. From July to December 2025, overall reporting performance was 94.4% for completeness and 88.1% for timeliness. Completeness met and exceeded was the national standard (≥ 90%) throughout the reporting period.

However, the overall timeliness performance fell below the national benchmark, particularly in October (78.9%) and December (83.1%). This decline may have been due to delays associated with post general election period in October. The highest completeness score was recorded in August at 96.3% (Table 1).

Table 1: Average Timeliness and Completeness of Health Facility Reporting by Month, July – December 2025

Month	% of Timeliness	% of Completeness
July	93.2	96.2
August	94.1	96.3
September	93.2	96.2
October	78.9	93.3
November	92.5	95.8
December	83.1	90.6
Overall Performance	88.1	94.4

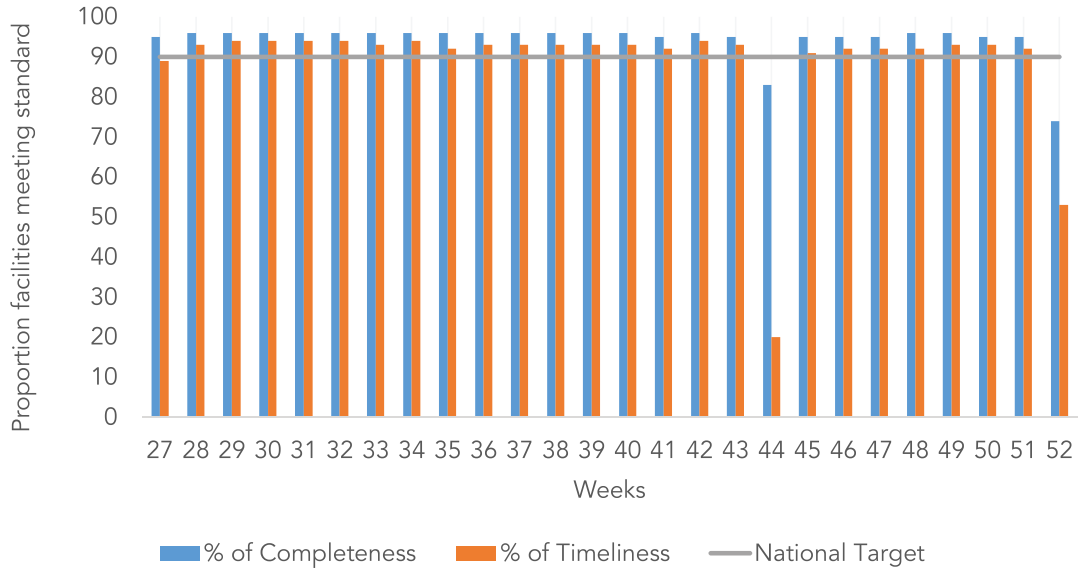

Figure 1: Completeness and Timeliness of Health Facilities Reporting by Week, July – December, 2025 (Epidemiological Week 27– 52)

As presented in Figure 1, the national target for timeliness of ≥ 90% was not met during the epidemiological weeks 27, 44 and 52. In contrast, completeness target was met in all the weeks except epidemiological week 44 and 52. The simultaneous decline in both timeliness and completeness during weeks 44 and 52 indicates a broader reporting system disruption rather than isolated delays. The sharp drop observed in week 44 may be attributed to operational disruption that occurred during and immediately after general election held on October 29, 2025

Delays in reporting (reduced timeliness) can hinder early detection of outbreaks and delay public health response, while reduced completeness comprises the representatives and reliability of surveillance data for decision making. Such interruptions, even if temporary, may weaken situational awareness and increase the risk of undetected public health events. Strengthening contingency plans and ensuring continuity of surveillance activities during national events and other disruptions is therefore critical to maintaining system resilience and protecting public health.

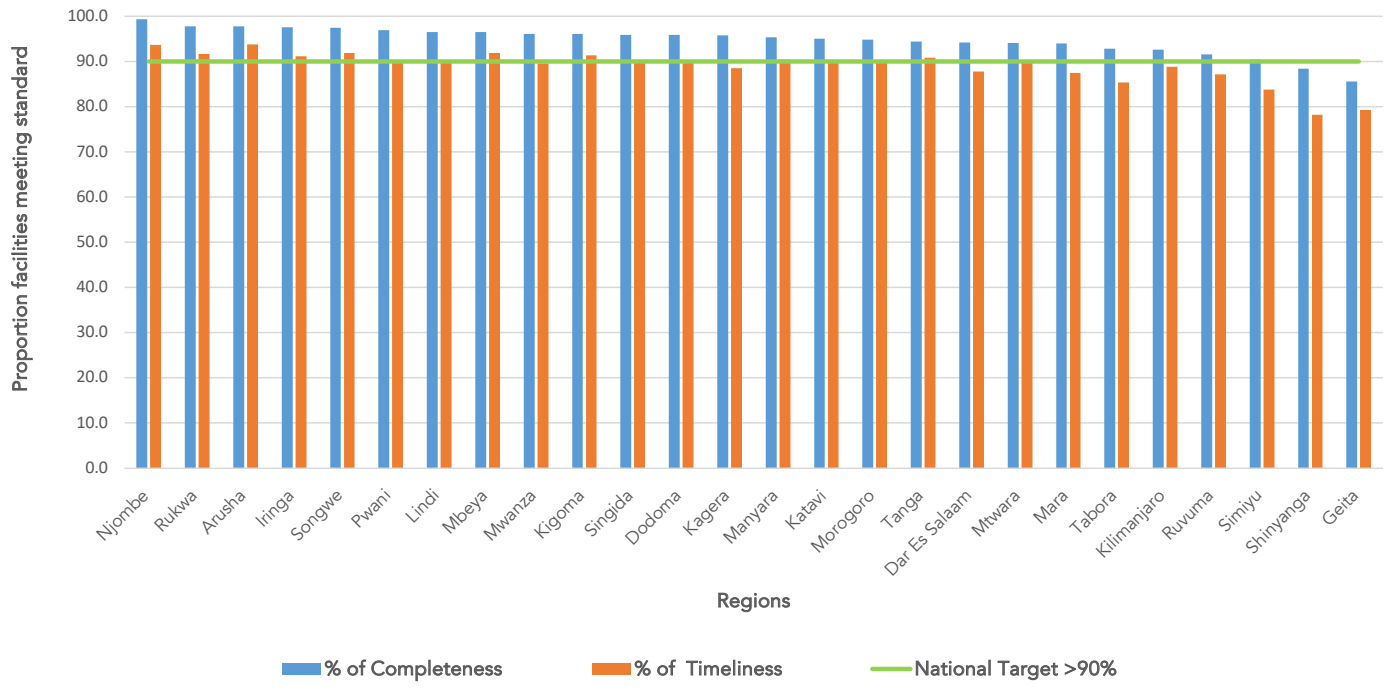

Figure 2: Timeliness and Completeness of Health Facility Reporting from the 26 regions, July – December, 2025

The overall completeness and timeliness of health facilities reporting by all 26 regions are illustrated in Figure 2. All regions, except Shinyanga and Geita, had overall completeness scores meeting the national target of ≥ 90%.

However, 9 of 26 regions (34.6%) namely Kagera, Dar es Salaam, Mara, Tabora, Kilimanjaro, Ruvuma, Simiyu, Shinyanga and Geita recorded timeliness scores below the national target of ≥ 90%, highlighting the need for additional support to improve prompt reporting.

Table 2: Proportions of Health Facilities Timeliness and Completeness Reporting, by month by Region and months, July - December, 2025

Regions	July		August		September		October		November		December		Overall Performance	
	% of Completeness	% of Timeliness	% of Completeness	% of Timeliness	% of Completeness	% of Timeliness	% of Completeness	% of Timeliness	% of Completeness	% of Timeliness	% of Completeness	% of Timeliness	% of Completeness	% of Timeliness
Arusha	97.9	96.5	97.8	96.7	97.7	96.8	97.7	84.6	97.6	96.5	97.9	93.5	97.8	93.8
Dar Es Salaam	98.6	95.5	98.6	96.8	97.4	94.4	91.7	74.5	93.6	89.9	85.0	76.8	94.2	87.7
Dodoma	97.8	95.4	97.5	91.0	98.6	94.7	95.9	79.4	98.4	97.8	86.3	84.2	95.8	90.2
Geita	87.3	84.8	86.8	85.8	86.2	84.2	86.0	70.5	84.3	80.7	82.3	70.0	85.6	79.2
Iringa	98.5	95.3	98.5	95.4	98.4	93.6	97.2	82.8	99.2	95.3	93.1	85.5	97.5	91.1
Kagera	96.4	92.5	97.1	94.8	96.5	89.4	96.7	83.6	96.0	91.6	91.7	79.7	95.8	88.5
Katavi	95.5	92.9	98.8	96.6	99.0	98.0	91.6	78.5	95.8	92.9	90.4	85.3	95.0	90.3
Kigoma	97.2	94.6	97.6	96.0	96.9	94.3	94.1	81.7	98.4	95.4	92.5	87.7	96.1	91.4
Kilimanjaro	93.0	91.7	93.0	90.9	93.0	92.4	93.0	82.2	93.0	91.9	90.7	85.1	92.6	88.9
Lindi	97.8	95.3	98.6	97.3	98.2	95.6	96.2	80.5	96.5	90.5	91.6	80.3	96.5	89.8
Manyara	96.9	93.3	97.0	95.2	97.0	95.0	94.9	82.1	96.5	93.8	89.7	84.7	95.4	90.4
Mara	97.7	94.6	97.3	92.2	96.3	90.5	88.0	74.7	93.8	88.3	91.2	86.1	93.9	87.5
Mbeya	97.8	96.8	97.8	97.3	97.7	96.1	97.5	82.1	97.5	95.0	90.2	85.6	96.5	91.9
Morogoro	96.7	92.6	98.0	95.0	98.2	94.7	92.1	80.7	97.9	95.8	86.3	80.7	94.8	89.7
Mtwara	95.2	93.4	95.1	93.2	95.3	93.5	91.1	78.6	94.5	92.4	94.1	90.2	94.1	89.9
Mwanza	96.4	94.3	96.6	95.5	96.2	93.7	95.1	78.5	96.6	95.1	96.0	82.1	96.1	89.6
Njombe	98.7	96.7	99.8	98.1	100.0	98.5	99.8	81.2	99.9	98.1	98.2	91.5	99.4	93.6
Pwani	96.7	89.8	97.4	95.0	98.6	95.5	98.4	81.0	98.5	95.2	91.8	84.8	97.0	89.8
Rukwa	98.7	97.0	98.7	97.2	98.8	93.8	97.6	77.6	99.8	97.8	93.1	88.8	97.8	91.7
Ruvuma	94.1	91.9	93.9	92.6	94.0	92.1	87.4	75.6	93.9	91.2	86.2	81.3	91.5	87.1
Shinyanga	94.3	88.8	90.6	84.3	88.8	80.2	82.6	66.4	89.5	75.6	84.9	74.4	88.4	78.2

Regions	July		August		September		October		November		December		Overall Performance	
	% of Completeness	% of Timeliness	% of Completeness	% of Timeliness	% of Completeness	% of Timeliness	% of Completeness	% of Timeliness	% of Completeness	% of Timeliness	% of Completeness	% of Timeliness	% of Completeness	% of Timeliness
Simiyu	92.6	88.2	91.4	88.8	90.1	85.4	84.3	74.3	90.3	84.5	95.0	82.9	90.5	83.8
Singida	96.0	92.8	98.0	97.2	98.0	96.8	94.6	80.6	97.7	96.4	91.2	78.9	95.9	90.2
Songwe	98.5	97.6	98.3	97.8	98.3	97.4	98.5	80.2	100.0	95.3	91.0	84.5	97.5	91.9
Tabora	95.9	87.9	94.8	91.5	97.0	93.4	88.5	75.4	96.3	93.1	84.8	72.5	92.8	85.3
Tanga	95.3	94.1	95.3	94.8	95.3	94.6	95.3	83.8	95.3	94.4	89.6	84.3	94.4	90.9
Grand Total	**96.2**	**93.2**	**96.3**	**94.1**	**96.2**	**93.2**	**93.3**	**78.9**	**95.8**	**92.5**	**90.6**	**83.1**	**94.7**	**88.9**

Table 2 presents the monthly proportion of health facilities reporting by region. In October, no region met the national timeliness target of ≥ 90.0%.

In Dar es Salaam region, timeliness remained below the national target at 74.5% in October, 89.9% in November and 76.8% in December. Similarly, Geita region reported both completeness and timeliness below the target (≥ 90.0%) across all months under review.

The highest timeliness score was 98.5% recorded in Njombe region in the month of September, while the lowest score was 66.4% recorded from Shinyanga region in October.

Regarding completeness, the highest score (100.0%) was achieved by Njombe in September and Songwe in November, whereas the lowest score 82.3% was recorded from Geita in December.

Distribution of Cases and Deaths

A total of 346,739 cases of all reportable diseases and conditions were reported between July and December 2025. Of these, 179,725 (51.8%) cases were due to diarrheal diseases (Table 2). During the same reporting period, a total of 31 deaths were reported of which 19 (61.3%) were due to suspected cholera. Suspected cholera also had the highest case fatality rate (CFR) among all reported conditions, with 19 deaths out of 554 suspected cases, resulting in a CFR of 3.4%.

Table 3: Numbers of cases and deaths caused by reportable conditions, July - December 2025

Condition / Disease	Cases	Deaths	CFR (%)
Acute Flaccid Paralysis	220	0	0
Animal Bites	11455	0	0
Anthrax	15	0	0
Bloody Diarrhea	4	0	0
Cholera	554	19	3.4
Cerebrospinal Meningitis	23	0	0
Dengue Fever	8630	0	0
Diarrheal Diseases	179,725	0	0
Severe Acute Respiratory Illness	4036	12	0.3
Measles	540	0	0
Pneumonia	106699	0	0
Rabies	28	0	0
Snake Bite	4455	0	0
Typhoid	30355	0	0
Total	346739	31	-

Key: CRF = Case Fatality Rate

Table4: Number of cases and deaths caused by reportable conditions, by month, July – December, 2025

Cases/Conditions	July		August		September		October		November		December		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
AFP	24	0	28	0	24	0	23	0	45	0	76	0	220	0
Animal Bites	2,281	0	1,895	0	1,778	0	2,012	0	1,582	0	1,907	0	11,455	0
Anthrax	1	0	3	0	1	0	3	0	5	0	2	0	15	0
Bloody Diarrhea	0	0	1	0	0	0	2	0	1	0	0	0	4	0
Cholera	195	6	121	7	37	3	32	0	152	3	17	0	554	19
CSM	9	0	3	0	1	0	8	0	2	0	0	0	23	0
Dengue Fever	76	0	2	0	2	0	8,546	0	0	0	4	0	8,630	0
Diarrheal Diseases	31,925	0	31,784	0	35,221	0	29,690	0	27,311	0	23,794	0	179,725	0
SARI	594	0	499	1	519	11	728	0	795	0	901	0	4,036	12
Measles	66	0	81	0	49	0	53	0	103	0	188	0	540	0
Pneumonia	23,951	0	18,494	0	16,657	0	19,101	0	14,667	0	13,829	0	106,699	0
Rabies	3	0	12	0	1	0	4	0	4	0	4	0	28	0
Snake Bite	793	0	562	0	602	0	815	0	828	0	855	0	4,455	0
Typhoid	6,182	0	4,991	0	4,682	0	5,508	0	4,421	0	4,571	0	30,355	0
Total	66100	6	58476	8	59574	14	66525	0	49916	3	46148	0	346739	31

Key: AFP = Acute Flaccid Paralysis; SARI= Severe Acute Respiratory Illness; CSM = Cerebrospinal Meningitis

Table 4 summarizes the cases and deaths attributed to immediately reportable conditions from July to December 2025. Bloody diarrhea was rarely reported, with only 4 cases reported across August, September and October. Dengue fever cases were predominantly reported in October, accounting for 8,546 of the 8,630 case (99.0%). Overall, there more cases in quarter 3 (July-September) with 184,150 (53.1%) cases compared to quarter 4 (October-December). Monthly case numbers ranged from 49,916 in December to 66,525 in October. The highest number of deaths occurred in September, with 14 fatalities (45.2%) reported during the review period.

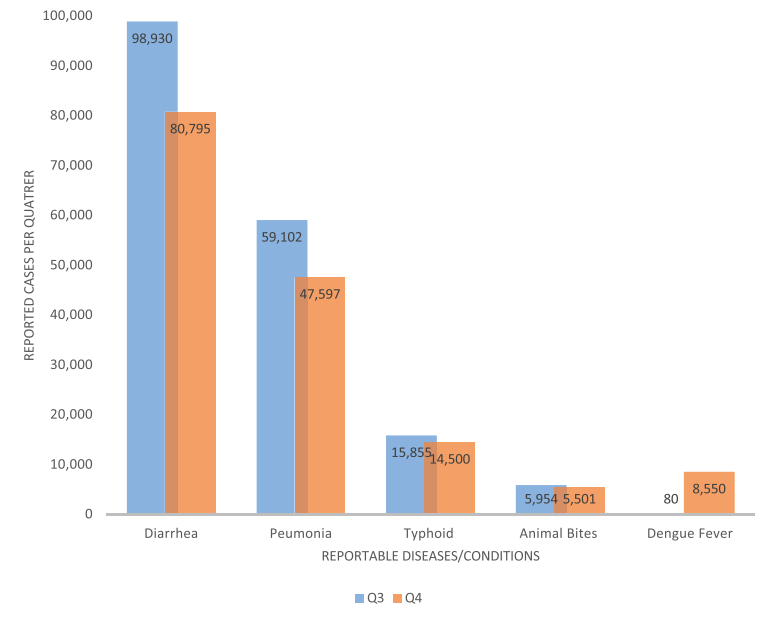

Figure 2: Trends in Immediate Reportable Conditions with High Cases Count (Quarter 3 and Quarter 4, 2025)

Among all immediate reportable conditions with high cases counts during the reporting period (July-Decembers 2025), cases decline in Quarter 4 (October-December) compared to Quarter 3 (July-September). The only exception was dengue fever, which showed an increase in Quarter 4 as illustrated in Figure 2.

Table 5: Number of reported cases of illnesses by region, July – December, 2025.

Regions	AFP	Animal Bites	Anthrax	Bloody Diarrhea	Cholera	CSM	Dengue Fever	Diarrhea	SARI	Measles	Pneumonia	Rabies	Snake Bite	Typhoid
Arusha	2	627	13	0	0	0	360	7,139	601	6	12,105	1	54	198
Dar Es Salaam	26	474	0	0	0	0	411	9,340	2,359	130	5,582	1	245	1,023
Dodoma	6	1,231	0	0	17	0	501	10,779	282	15	4,213	0	279	1,660
Geita	1	130	0	0	0	0	176	4,459	0	7	2,818	1	32	885
Iringa	3	253	0	1	0	0	66	1,233	98	11	1,038	0	86	314
Kagera	13	382	0	1	0	0	263	6,741	3	25	4,587	2	172	1,778
Katavi	8	434	0	0	0	3	264	5,481	0	12	2,709	5	104	1,053
Kigoma	16	550	0	0	125	3	309	9,290	34	48	4,506	2	263	876
Kilimanjaro	13	434	2	0	0	0	150	3,784	0	17	5,672	0	152	529
Lindi	2	338	0	0	0	0	230	3,995	0	0	1,837	0	160	1,835
Manyara	8	584	0	1	0	2	345	6,005	468	7	7,551	0	151	1,595
Mara	5	954	0	0	61	0	511	13,032	43	3	7,029	0	148	1,264
Mbeya	6	263	0	1	46	0	290	5,760	0	11	3,558	0	201	1,633
Morogoro	11	813	0	0	0	1	740	15,516	2	20	7,398	2	346	3,946

Regions	AFP	Animal Bites	Anthrax	Bloody Diarrhea	Cholera	CSM	Dengue Fever	Diarrhea	SARI	Measles	Pneumonia	Rabies	Snake Bite	Typhoid
Mtwara	6	208	0	0	125	0	274	6,078	20	4	2,774	4	217	655
Mwanza	10	393	0	0	40	0	426	8,080	27	8	2,711	3	192	698
Njombe	8	212	0	0	0	0	73	1,564	0	35	1,515	0	105	611
Pwani	14	589	0	0	0	0	240	5,426	0	41	3,758	0	370	649
Rukwa	8	207	0	0	49	0	411	9,019	0	34	3,190	0	116	471
Ruvuma	0	371	0	0	50	0	465	7,665	4	0	4,083	1	253	2,263
Shinyanga	5	286	0	0	40	0	425	7,707	0	9	3,495	0	165	1,451
Simiyu	0	326	0	0	0	0	323	5,174	0	0	2,645	1	157	628
Singida	0	549	0	0	0	0	355	5,606	23	0	2,070	0	128	1,393
Songwe	8	46	0	0	1	0	85	2,173	0	16	1,418	1	26	874
Tabora	18	463	0	0	0	0	609	11,991	19	29	2,987	2	83	1,801
Tanga	23	338	0	0	0	14	328	6,688	53	52	5,450	2	250	272
Grand Total	220	11,455	15	4	554	23	8,630	179,725	4,036	540	106,699	28	4,455	30,355

Table 5 present the regional distribution of reported cases over a six-months period from July to December 2025. A total of 346,739 reportable cases were recorded during this period. Six conditions were reported from all 26 regions. Of these, Morogoro reported the highest number of cases for diarrheal diseases (15,516; 8.6%), typhoid (3,946;13.0%) and dengue fever (740; 8.6%). Other conditions with the highest regional counts included animal bites in Dodoma (1,231;10.8%), pneumonia in Arusha (12,105;11.3%), and snake bites in Pwani (370; 8.3%).

Anthrax cases were only reported from two regions: Arusha (13 cases) and Kilimanjaro (2 cases). The occurrence in these regions may be attributed to their recognition as anthrax hotspots in Tanzania, likely due to a combination of environmental, ecological and cultural factors.

Diarrheal diseases accounted for majority of reported cases (179,725; 51.8%). The highest number were reported in Morogoro (15,516; 8.6%), Mara (13,032; 7.3%), Tabora (11,991; 6.7%) and Dodoma (10,779; 6.0%), (Table 5).

CONCLUSION

The IDSR data for July to December 2025 (WHO epidemiological weeks 27-52) indicated that the reporting completeness remained high and met the national standard of ≥90%. However, reporting timeliness fell below the set national target, with a notable decline in October. This drop may have been influenced by disruption associated with general election held in October 2025. It should be noted that delays in reporting can hinder early detection of outbreaks and public health response. Hence, there is a need of strengthening contingency plans and ensuring continuity of surveillance activities during national events and other disruptions are therefore critical for maintaining system resilience and protecting public health. Diarrheal diseases remained the leading conditions during the reporting period, while suspected cholera cases recorded a high fatality rate. This underscores the need for the government to introduce additional measures and reinforce existing preventive and control strategies for diarrheal diseases and cholera.

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MUHTASARI
Mkakati Jumuishi wa Ufuatiliaji na Udhibiti wa Magonjwa ya Mlipuko (IDSR): Ripoti ya Miezi Sita, Julai-Desembe 2025 (Wiki 27-52)

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Utangulizi: Wizara ya Afya (WAF) Tanzania inaendelea kutekeleza mfumo wa ufuatiliaji wa magonjwa na hali za kiafya zinazotakiwa kuripotiwa kupitia Mkakati Jumuishi wa Ufuatiliaji na Udhibiti wa Magonjwa ya Mlipuko (IDSR). Takwimu za IDSR hukusanywa kwa njia ya kielektroniki na kuwasilishwa WAF kwa mtiririko. Lengo kuu la IDSR ni kutoa mwelekeo msingi wa kufanya maamuzi ya kisera na kusaidia utekelezaji wa afua bora za afya kwa umma dhidi ya magonjwa ya kuambukiza yaliyopewa kipaumbele ambayo ni chanzo cha vifo na ulemavu. Makala hii inawasilisha matokeo ya uchambuzi wa takwimu za IDSR kwa kipindi cha miezi 6 kuanzia Julai hadi Desembe 2025 ambapo inalingana na wiki za kiepidemilogia za Shirika la Afya Duniani (WHO) 27-52.

Mbinu za Utafiti: Takwimu zilichukuliwa kutoka kwenye mfumo wa IDSR na kuchambuliwa ili kutathmini utendaji katika ngazi ya kitaifa na wa kila mkoa kuzingatia na vigezo viwili muhimu vya WHO: uwasilishaji wa taarifa kwa wakati (Ufanisi) kwa mfano, asilimia ya wilaya zinazoripoti kwa wakati kwa ngazi ya kitaifa (timeliness) na ukamilifu wa taarifa (completeness) yaani, asilimia ya wilaya zinazotoa ripoti kamili kwa ngazi ya kitaifa kulingana na miezi na mikoa. Utendaji ulipimwa kwa kuzingatia kiwango cha kitaifa kilichowekwa cha asilimia 90 au zaidi (≥ 90%) kwa kila kigezo. Aidha, uchambuzi ulijumuisha idadi ya visa na vifo vilivyoripotiwa kwa jumla pamoja na mgawanyo wake kwa miezi na mikoa

Matokeo: Mikoa yote 26 ya Tanzania Bara iliwasilisha taarifa za kila wiki katika ngazi ya kitaifa, na kufikia wastani wa ukamilifu wa taarifa wa 97.2% katika miezi yote, hivyo kufikia lengo la kitaifa la ≥ 90%. Hata hivyo, wastani wa uwasilishaji wa taarifa kwa wakati ulikuwa 88.1%, chini ya kiwango cha kitaifa cha ≥ 90%. Malengo ya kitaifa ya ukamilifu na uwasilishaji kwa wakati yalifikiwa katika wiki zote isipokuwa wiki za kiepidemiolojia 44 na 52, pamoja na wiki ya 27 kwa upande wa uwasilishaji kwa wakati. Kwa ujumla, jumla ya visa 346,739 na vifo 31 viliripotiwa kwa magonjwa na hali zote zinazotakiwa kuripotiwa mara moja kupitia IDSR. Hali iliyoripotiwa zaidi ilikuwa magonjwa ya kuhara, yakichangia asilimia 51.8 (179,725) ya visa vyote, na viliripotiwa katika mikoa yote 26, huku idadi kubwa ikitoka Mkoa wa Morogoro (15,516; 8.6%). Mkoa wa Morogoro pia uliripoti idadi kubwa ya homa ya matumbo (typhoid) (3,946; 13.0%) na homa ya dengue (740; 8.6%) ikilinganishwa na mikoa mingine. Kwa ujumla, visa vingi zaidi viliripotiwa katika robo ya tatu ya mwaka (Julai–Septemba) ambapo kulikuwa na visa 184,150 (53.1%) ikilinganishwa na robo ya nne (Oktoba–Desemba). Kati ya vifo 31 vilivyoripotiwa, vingi vilisababishwa na kipindupindu (n=19; 61.3%). Visa vilivyoshukiwa kuwa vya kipindupindu vilikuwa na kiwango cha juu zaidi cha vifo (Case Fatality Rate - CFR), ambapo vifo 19 vilitokea kati ya visa 554 vinavyoshukiwa, sawa na CFR ya 3.4%.

Hitimisho: Takwimu za IDSR kwa kipindi cha Julai hadi Desemba 2025 (wiki za WHO 27–52) zinaonesha kuwa ukamilifu wa taarifa uliendelea kuwa wa juu na kufikia kiwango cha kitaifa cha ≥ 90%. Hata hivyo, uwasilishaji wa taarifa kwa wakati ulikuwa chini ya lengo lililowekwa, hasa kutokana na kushuka kulikobainika mwezi Oktoba. Hali hii huenda ilisababishwa na usumbufu uliohusiana na uchaguzi mkuu uliofanyika Oktoba 2025. Inapaswa kuzingatiwa kuwa ucheleweshaji wa uwasilishaji wa taarifa unaweza kuathiri utambuzi wa mapema wa milipuko ya magonjwa na udhibiti kwa afya ya umma. Hivyo, kuna umuhimu wa kuimarisha mipango ya dharura na kuhakikisha mwendelezo wa shughuli za ufuatiliaji wakati wa matukio ya kitaifa na usumbufu mwingine ili kudumisha uimara wa mfumo na kulinda afya ya umma. Magonjwa ya kuhara yaliendelea kuwa tatizo kuu katika kipindi cha taarifa, huku visa vya kipindupindu vilionesha kiwango cha juu cha vifo. Hali hii inaonesha umuhimu wa serikali kuanzisha hatua za ziada na kuimarisha mikakati iliyopo ya kinga na udhibiti wa magonjwa ya kuhara na kipindupindu

Maneno Muhimu: Mkakati wa Ufuatiliaji na Udhibiti wa Magonjwa ya Mlipuko, Wiki 27-52, 2025, Tanzania.

Determinants of Cholera Transmission in Mpwapwa District Council, Dodoma Region, Tanzania: An Unmatched Case-Control Study, December 2025.

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ABSTRACT

Introduction: Cholera remains a recurrent public health challenge in Tanzania, particularly in settings with limited access to safe water, sanitation, and hygiene (WASH) services. On December 15, 2025, Mpwapwa District Council in Dodoma Region reported a cholera outbreak concentrated in Malolo Ward. A national surveillance team from the Ministry of Health (MoH), Prime Ministers' Office, Regional Administration and Local Government (PMO-RALG), and the Tanzania Field Epidemiology and Laboratory Training Program (TFELTP) conducted an outbreak investigation to determine the transmission drivers and guide response measures.

Methodology: An unmatched case-control study was done with a ratio of one case to three randomly selected controls. Data on social demographic, environmental and behavioral factors were collected through interview using a standardized questionnaire via Kobo Collect and analyzed using STATA version 17. QGIS version 3.4 was used for spatial mapping. Logistic regression analysis was performed and variables with p-value <0.2 in bivariable analysis were included in multivariable analysis, while variables with p-value <0.05 were considered statistically significant.

Results: A total of 148 individual were enrolled including 37 cases and 111 controls whereby the epidemic curve suggested a common-source outbreak. Children aged 0-14 years accounted for a larger proportion of cases 15 (40.5%) compared with controls 34 (30.6%). Multivariable analysis showed not treating drinking water and sharing drinking water with a known case were independent risk factors (AOR = 31.0, 95% CI: 2.90 - 343.28, p = 0.005), (AOR = 4.5, 95% CI: 1.39 - 14.47, p = 0.012) respectively. While handwashing before eating and awareness of cholera were significant protective factors (AOR = 0.1, 95% CI: 0.01 - 0.60, p = 0.012), (AOR = 0.2, 95% CI: 0.06 - 0.74, p = 0.016) respectively. Approximately 250 residents received health education, and 111 households were provided with water treatment tablets.

Conclusion: This outbreak investigation demonstrates that cholera transmission in Mpwapwa, District Council was primarily driven by unsafe drinking water sources particularly from rive Sasima, lack of water treatment, unsafe water-sharing at household level, and inadequate hygiene behaviors. Protective factors such as hand hygiene and cholera awareness significantly reduced infection risk. These findings underscored the need for integrated Water, Sanitation and Hygiene (WASH) interventions, sustained community health education, and strengthened outbreak preparedness systems to prevent cholera outbreaks in similar rural settings.

Keywords: Cholera, Outbreak, Transmission Determinants, Mpwapwa, Tanzania

INTRODUCTION

Cholera is an acute, toxin-mediated diarrheal disease caused by ingestion of food or water contaminated with ***Vibrio cholerae,*** a Gram-negative bacterium [1]. The disease originated in the Ganges Delta of India in the 19th century and has since caused multiple global pandemics, remaining a persistent public health threat worldwide [2]. Globally, cholera is estimated to cause up to 4.0 million cases and approximately 143,000 deaths each year. In recent years, the global burden has increased, with a notable rise in cases reported to the World Health Organization (WHO). In 2023 alone, more than 535,000 cases and over 4,000 deaths were reported from 45 countries. The continued occurrence of cholera reflects persistent inequities in access to safe drinking water, sanitation, and healthcare services [2].

Africa bears a disproportionate share of the global cholera burden, accounting for an estimated 2,860,000 cases and 95,000 deaths annually. Sub-Saharan Africa contributes approximately 60% of these cases [3]. In 2023, WHO member states in the African region reported 3,541 cholera-related deaths, corresponding to a case fatality rate (CFR) of 1.9%. Malawi was particularly affected, contributing more than half of the reported fatalities during that year [4].

Cholera remains a public health issue of concern in Tanzania and has posed a recurrent public health challenge for more than four decades. The country recorded the highest case fatality rate

ever documented in East Africa during the 1992 outbreak and experienced the longest nationwide outbreak between 2015 and 2018, during which a total of 33,319 cases were reported across all 26 regions [5]. Despite ongoing control efforts, Tanzania continues to face challenges in attaining universal access to safe and clean drinking water and adequate sanitation, especially in unplanned settlements, peri-urban areas, and communities that rely on surface water sources [6].

The occurrence of cholera in Mpwapwa DC reflects ongoing vulnerabilities associated with recurrent outbreaks, climatic variability, population movement, and persistent gaps in WASH services. These factors necessitating a focused outbreak investigation to characterize transmission dynamics, identify risk factors, and inform targeted public health interventions aimed at preventing further spread and reducing morbidity and mortality. This paper reports the determinants of cholera transmission during the December 2025 outbreak in Mpwapwa District Council, Dodoma Region

METHODOLOGY

Study Design

An unmatched case control study was employed to investigate the determinants of the cholera outbreak in Mpwapwa District Council, Dodoma Region. The design was selected to allow comparison of exposures and risk factors between individuals who developed cholera (cases) and those did not (controls) within the same community and outbreak period. The approached enabled efficient assessment of multiple potential environmental, behavioral, and WASH related determinants associated with cholera transmission during outbreak.

The study was conducted over a period of **six days, from 22 to 27 December 2025** guided by the working hypothesis that cholera cases are associated with consumption of contaminated and untreated water from river Sasima as well as poor sanitation and hygiene practices.

Study Setting

The outbreak investigation was conducted in Malolo Village and Ward, located in Mpwapwa District Council, Dodoma Region central Tanzania. Malolo Village has a population of 3,161 and comprises six hamlets: Dar es Salaam, Manzese, Msasani, Kihesa, Inteki, and Kiwindi (Table 1). The village is served by a single primary healthcare facility, Malolo Dispensary. Residents requiring high-level of care are referred to Malolo Health Centre, located across River Sasima in Kilosa District, Morogoro Region.

Geographically, Mpwapwa District is characterized by semi-arid condition with seasonal rainfall pattern that influence water availability. During rainy season, surface water sources such as rivers and ponds are commonly used for domestic purposes, increasing the risk of contamination. Access to improved water and sanitation facilities remains limited in parts of ward, with some households relying on untreated surface water and practicing open defecation. These environmental and WASH conditions, coupled with seasonal rainfall and population movement, create a favorable setting for cholera transmission and recurrent outbreaks.

Table 1: Number of Households with Corresponding Population per Hamlet

Name of Hamlet	Number of Households	Population
Msasani	78	219
Kihesa	260	752
Dar es Salaam	230	1623
Inteki	117	270
Kiwindi	56	175
Manzese	86	122
Total	**827**	**3161**

Study Population

The study population comprised residents of the affected communities in Mpwapwa District Council during the outbreak period in December 2025. Cases included individuals who met the cholera case definition and were identified through active case finding, medical record review and household visits. Controls were from the same communities as cases and consistent of individuals who did not develop symptoms of cholera during the outbreak. Controls were recruited from neighboring households and were selected to represent the population at risk with the same environment and social-demographic context

Case Definition and Case Finding

Case: A suspected cholera case was defined as any person residing in or having visited Malolo Village within 14 days prior to December 15, 2025 and onwards, who developed acute watery diarrhea, with or without vomiting. The person is alive and available in area of locality during the period of investigation. Due to operational and logistical constrains, the outbreak investigation relied primarily on clinical and epidemiological case definitions for surveillance and analysis. Severely ill cholera case not able to respond to the interview and who declined to participate were excluded from the study.

Control: A control was defined as any individuals, residing in or having visited Malolo Village who did not develop acute watery diarrhea or vomiting during the 14 days prior to December 15, 2025 and onwards, and should be resided in the household that reported no cholera case during the outbreak. However, eligible Individuals who declined to participate were excluded from the study

Study Sample Size

By the help of the District IDSR focal person the line list, medical records and active case search through household visit a total of 148 individuals were enrolled including 37 cases identified during the investigation and 111 randomly selected controls from neighboring households that did not give rise to a case, resulting in a case-to-control ratio of 1:3. This approach was used to increase the statistical power of the study to detect association between exposures and cholera infection.

Data Collection Methods

Cases were identified from the existing line list and through active case finding using outpatient department registers following comprehensive document review. Controls were selected from neighboring households and comprised individuals who did not develop the outcome of interest. Data collection for both cases and controls were conducted through household interviews and direct observation of household WASH conditions using a standardized questionnaire administered via the Kobo Collect electronic data collection tool. In parallel, active community case finding was conducted with the support of local leaders and community health care workers who facilitated household visits. Information collected included socio-demographic characteristics, water sources, water treatment practices, water storage methods, sanitation facilities, hygiene practices, food consumption behavior, knowledge and awareness of cholera and exposure history.

Environmental Assessment

An environmental assessment was conducted to identify potential environmental sources and transmission pathways of the cholera outbreak in Malolo Village, Mpwapwa District Council. The assessment focused on drinking water sources, water handling and storage practices, sanitation facilities such as Latrine type, presence of hand-washing facilities outside the toilet and hygiene conditions at household and community levels.

Laboratory Investigation

Stool samples using rectal swabs were collected from eight (8) suspected cases two samples per each case for rapid diagnostic test and culture respectively, those samples that turned positive were transported to the designated regional laboratory for culture conformation by following standard biosafety and transport protocols and were tested for ***Vibrio cholerae*** using standard Laboratory methods.

We systematically collected water samples from three sampling sites. Two samples were taken from a water stream (river): one sample was collected upstream at a site locally known as Inteki, and the second sample was collected downstream at Manzese area. In addition, one sample was collected from a community hand-pump well at Manzese hamlet for culture.

Data Management and Analysis

The collected data was downloaded into Microsoft Excel for initial cleaning, coding and subsequently analyzed using STATA version 17. Descriptive analysis was conducted to summarize the characteristics of the cholera cases. Variables were summarized using frequencies and percentages, and results were presented in the form of tables, graphs, and narrative summaries to illustrate key trends including epidemic curve and distribution of cases by place, person and time. Collected geocoordinates were used for geospatial mapping of cases using QGIS version 3.4.

Analytical analysis was conducted to assess determinants of cholera transmission, with cholera case status as the outcome variable (coded as Yes for a case and No for controls) serving as dependent variable. Socio-demographic factors (age, sex, occupation, education level, Hamlet of residence and household size); WASH-related factors (water source, latrine type, distance to water source and handwashing facilities outside the toilet); and behavioral factors (water storage and drawing practices, sharing of latrines and handwashing before and after eating, open defection practice and sharing drinking water with a known case) were treated as independent variables.

Bivariate analysis was performed using chi-square tests to identify potential determinants. Variables with a p-value <0.2 in the bivariate analysis were included in a multivariable logistic regression model to identify factors independently associated with cholera. Adjusted odds ratios (AOR) with 95% confidence intervals were reported, and variables with a p-value <0.05 considered statistically significant.

RESULTS

Epidemiological Trends and Characteristics of Cholera Cases in Mpwapwa District Council

The epidemic curve shows that the index case developed acute diarrhea and vomiting on December 6, 2025, followed by the second case three days later on December 9, 2025 with no identifiable epidemiological linkage to the index case. A sharp increase in incident cases was observed from December 12, 2025. The outbreak reached its peak on December 15, 2025, with the highest daily case count (n=11) suggesting intense exposure and/or sustained transmission during this period. Thereafter, case count declined progressively, with the last reported case occurring on December 19, 2025. The overall epidemic curve pattern is consistent with a common source outbreak with evidence of possible propagated transmission (Figure 1)

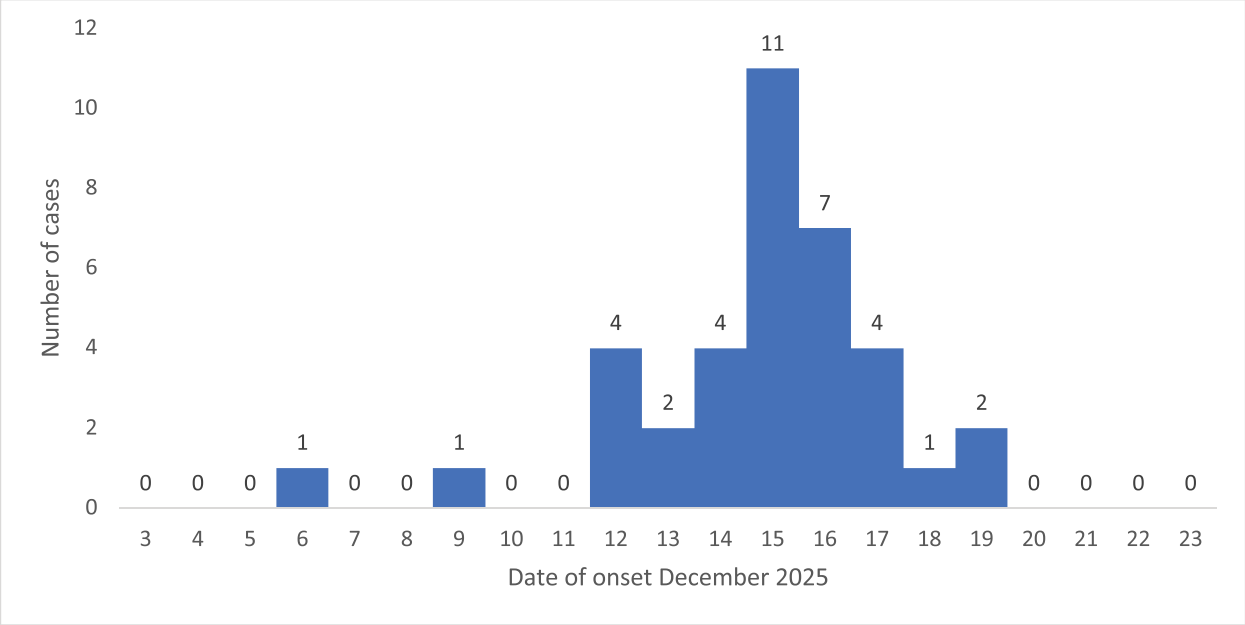

Figure 1: Trend of Cholera Cases from 6 December to 19 December 2025, in Malolo Village.

Laboratory Results

A total of eight stool samples were collected from suspected cholera cases and tested using a cholera rapid diagnostic test (RDT), 6(75%) samples were positive for *Vibrio cholerae,* while 2(25%) were negative. Furthermore, four of six samples which turned positive on rapid test were sent to the regional laboratory for culture confirmation, from which Vibrio cholerae was only isolated in 2(50%) samples.

Culture of water samples from River Sasima showed the isolation of Vibrio cholerae organisms by forming large yellow colonies, in contrast, the water sample collected from the community hand-pump well showed no presence of Vibrio cholerae.

Demographic Characteristics of Cholera Cases in Mpwapwa District, Dodoma Region

A total of 37 cholera cases meeting the standard case definition were identified through active case findings, including medical records review and household visits in the affected community during outbreak investigation. The median age of cases was 28 years (interquartile range [IQR]: 42-12 years). The majority of cases were aged 0-14 years (n=15; 40.5%), and females accounted for a slightly higher proportion of cases (n=20; 54.1%). Most cases had either primary level education or no formal education and were predominantly engaged in subsistence farming. More than half of the cases were from medium-sized households with Kihesa hamlet reporting the highest proportion of cases (Table 2).

Table 2: Social Demographic Characteristics of the Cholera Cases in Malolo Village Mpwapwa District Council in December 2025

Category	Cases (N=37)	Percentage (%)
Age (years)		
Median (IQR)	28 (42-12)	
Age group		
0 - 14	15	40.5
15-44	12	32.4
45+	10	27.1
Sex		
Female	20	54.1
Male	17	45.9
Hamlet of Residence		
Dar es salaam	10	27.0
Inteki	7	19.0
Kihesa	12	32.4
Msasani	8	21.6
Education level		
None	17	45.9
Primary	19	51.4
Secondary+	1	2.7
Occupation		
Employed	2	5.4
Subsistence Farmer	18	48.7
Child/Student	14	37.8
Unemployed	3	8.1
Household size		
Small (1-4)	15	40.5
Medium (5-7)	19	51.4
Large (≥7)	3	8.1

Geospatial Distribution of Cholera Cases in Malolo Village

Geospatial map (Figure 2), demonstrated that cholera cases were geographically concentrated within Malolo Ward, which indicating a local outbreak rather than a widespread transmission across the ward. Within Malolo Ward, cases specifically clustered in Mololo Village, with a clear spatial aggregation pattern suggestive of a common source outbreak.

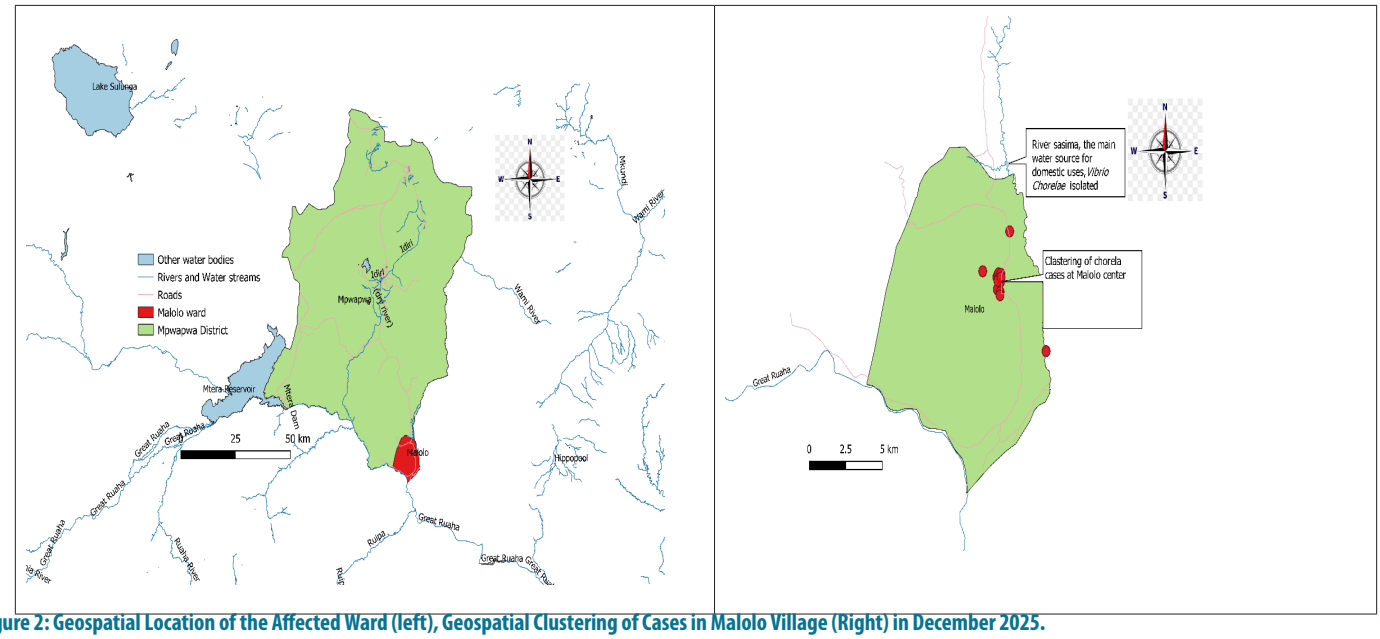

Figure 2: Geospatial Location of the Affected Ward (left), Geospatial Clustering of Cases in Malolo Village (Right) in December 2025.

Socio-demographic Characteristics and WASH Related and Behavioral Characteristics of Cases and Controls

A total of 148 individuals were enrolled in a study including 37 cases and 111 controls. Children aged 0-14 years constituted a higher proportion of cases (n=15; 40.5%) compared with controls (n=34;30.6%), while individuals aged 15 - 44 years were more prevalent among controls (n=54; 48.7%) than cases (n=12; 32.4%). The distribution of hamlet of residence was generally similar between cases and controls (Table 3).

All cholera cases (n=37; 100%) reported using river or stream water as their primary source of drinking water, compared with (n=100; 90.1%) controls, while none of the cases reported using piped or deep well water. Nearly all cases (n=36; 97.3%) reported not treating their drinking water, compared with 41 controls (36.9%). Unsafe water storage practices were more frequent among cases, with 10 cases (27.0%) using uncovered containers compared with 11 controls (9.9%).

Table 3: Socio-demographic Characteristics among Cases and Controls during Cholera Outbreak Investigation in Mpwapwa DC, December 2025 (N=111) for Controls and N=37 for Cases

Variable	Control (%)	Cases (%)	p-value
Age Group			
0-14	34 (30.6)	15 (40.5)	0.228
15-44	54 (48.7)	12 (32.4)	
45+	23(20.7)	10 (27.1)	
Household Size			
Small (1–4)	58 (52.3)	15 (40.5)	0.25
Medium (5–7)	40 (36.0)	19 (51.4)	
Large (8+)	13 (11.7)	3 (8.1)	
Hamlet			
Dar es Salaam	30(27.0)	10 (27.0)	1
Intake	21 (19.0)	7 (19.0)	
Kihesa	36 (32.4)	12 (32.4)	
Msasani	24 (21.6)	8 (21.6)	
Sex			
Female	66 (59.5)	20 (54.1)	0.564
Male	44 (40.5)	17 (45.9)	
Education			
None	35 (31.5)	17 (45.9)	0.082
Primary	60 (54.1)	19 (51.4)	
Secondary+	16 (14.4)	1(2.7)	
Occupation			
Employed	6 (5.4)	2 (5.4)	0.449
Subsistence Farmer	65 (58.6)	18 (48.7)	
Child/Student	37 (33.3)	14(37.8)	
Un employed	3 (2.7)	3 (8.1)	

Sanitation and hygiene practices differed substantially between cases and controls (Table 4). Open defecation was reported by 6 cases (16.2%) compared with 3 controls (2.7%). In addition, sharing drinking water with a known cholera case was reported by nearly half of cases (n=18; 48.7%), compared with 20 controls

(18.0%).

Table 4: WASH and Behavioral Related Characteristics among Cases and Controls during Cholera Outbreak Investigation in Mpwapwa DC, December 2025 (N=111) for Controls and N=37 for Cases)

Variable	Control (%)	Cases (%)	p-value
Water Source			
Deep well/Pipped	11 (9.9)	0 (0.0)	0.047
River/stream	100 (90.1)	37 (100.0)	
Water Treatment			
No	41 (36.9)	36 (97.3)	<0.001
Yes	70 (63.1)	1 (2.7)	
Storage Practice			
Covered	100 (90.1)	27 (73.0)	0.010
Uncovered	11 (9.9)	10 (27.0)	
Ate raw vegetables/kachumbari			
No	108 (97.3)	32 (86.5)	0.012
Yes	3 (2.7)	2 (13.2	
Water Drawing			
Dipping	51 (46.0)	14 (37.8)	0.389
Pouring	60 (54.0)	23 (62.2)	
Distance to Water Source			
<10 minutes	13 (11.7)	6 (16.2)	0.165
10–30 minutes	39 (35.1)	18 (48.7)	
>30 minutes	59 (53.2)	13 (35.1)	
Latrine Type			
Improved	50(45.1)	14(37.8)	0.443
Un improved	61(54.9	23(62.2)	
Latrine Sharing			
No	80(72.1)	25(67.6)	0.601
Yes	31(27.9)	12(32.4)	
Open Defection Practice			
No	108(97.3)	31(83.8)	0.003
Yes	3(2.7)	6(16.2)	
Hand Washing Station Outside the Toilet			
No	4(3.6)	8(21.6)	0.001
Yes	107(96.4)	29(78.4)	
Hand Washing Before and After Eating			
No	2(1.8)	11(29.7)	<0.001
Yes	2(98.2)	26(70.3)	
Awareness of Cholera			
No	36(32.4)	29(78.4)	<0.001
Yes	75(67.6)	8(21.6)	
Sharing Water with a Known Case			
No	91(82.0)	19(51.3)	<0.001
Yes	20(18.0)	18(48.7)	

Determinants of Cholera Transmission in Mpwapwa District Council

In multivariable logistic regression analysis, use of untreated water emerged as the strongest independent risk factor for cholera infection. Individuals who did not treat drinking water had significantly higher odds of illness compared with those who treated water (adjusted odds ration [AOR] = 31.0, 95% CI: 2.90 - 343.28, p = 0.005). Sharing drinking water with a known cholera case also remained independently associated with cholera infection (AOR = 4.5, 95% CI: 1.39 - 14.47, p = 0.012).

Conversely, handwashing before eating was identified as a significant protective factor (AOR = 0.1, 95% CI: 0.01 - 0.60, p = 0.012), as well as awareness of cholera (AOR = 0.2, 95% CI: 0.06 - 0.74, p = 0.016). Although several factors, including age group, education level, consumption of raw vegetables, open defecation, and presence of a handwashing station outside the toilet showed associations in crude (bivariate) analysis, these associations did not remain statistically significant after adjustment in the multivariable model (Table 5).

Table 5: Factors Associated with Cholera Transmission in Malolo Village Mpwapwa District Council December 2025

Variable	COR (95% CI)	p-value	AOR (95% CI)	p-value
Age group (years)				
0-14	1.0(0.38 - 2.65)	0.976	0.9(0.23 - 3.37)	0.842
15-45	0.5(0.19 - 1.35)	0.175	0.8(0.16 - 3.66)	0.750
>45	Ref		Ref	
Education				
Secondary+	Ref		Ref	
None	7.8 (0.95 - 63.57)	0.056	3.4 (0.21 - 51.80)	0.386
Primary	5.1 (0.63 - 40.76)	0.127	4.5 (0.28 - 71.18)	0.282
Water Treatment				
Yes	Ref		Ref	
No	61.5 (8.12 - 465.21)	<0.001	31 (2.90 - 343.28)	0.005
Ate Raw Vegetables/Kachumbari				
No	Ref		Ref	
Yes	5.6 (1.27 - 24.82)	0.023	3.2 (0.4 - 23.13)	0.257
Open Defecation				
No	Ref		Ref	
Yes	7.0 (1.65 - 29.48)	0.008	2.9 (0.47 – 17.60)	0.250
Handwashing Station Outside Toilet				
No	Ref		Ref	
Yes	0.14 (0.04 - 0.48)	0.02	0.4 (0.05 – 2.37)	0.296
Handwashing Before Eating				
No	Ref		Ref	
Yes	0.04 (0.01 - 0.21)	<0.001	0.1 (0.01 - 0.60)	0.012
Awareness of Cholera				
No	Ref		Ref	
Yes	0.13 (0.06 - 0.32)	<0.001	0.2 (0.06 - 074)	0.016
Sharing Drinking Water with Known Case				
No	Ref		Ref	
Yes	4.3 (1.92 - 9.65)	<0.001	4.5 (1.39 -14.47)	0.012

DISCUSSION

The findings of this study highlight unsafe water sources and poor water handling practices as central determinants of cholera transmission of cholera transmission in Malolo Village. Hence underscores the urgent need for sustained investments in safe water supply in the village, improved sanitation, hygiene promotion, strengthened surveillance, and community preparedness to prevent recurrent cholera outbreaks.

The epidemiological evidence indicates that the outbreak was consistent with a common-source outbreak with elements of propagated transmission, as demonstrated with spatial clustering of cases within specific hamlets and the temporal pattern of onset. This transmission patterns is consistent with cholera outbreaks associated with exposure to unprotected surface water sources, a well-documented driver of cholera transmission in Sub-Saharan Africa, where access to safe drinking water remains limited [2,6].

The absence of fatalities in this outbreak contrasts with findings from previous cholera outbreaks in Tanzania that reported high case fatality rates, indicating improvements in case detection, access to healthcare services and clinical case management as a part of effective outbreak response [6,7].

Analytical epidemiology findings strongly align with the investigation's working hypothesis that consumption of untreated and contaminated water was the primary driver of transmission. The strong independent association between use of untreated drinking water and cholera infection underscores the critical role of water quality in water in outbreak propagation. Reliance on river and stream water sources, coupled with minimal water treatment, creates sustained exposure to contaminated water, facilitating rapid transmission within households and community as observed to the present study. Untreated Water consumption emerged as a strong independent risk factor, underscoring the importance of point of use interventions in cholera prone settings. These findings are consistent with previous studies demonstrating that chlorination and other household water treatment methods significantly reduce the risk of cholera and other waterborne diseases, particularly during outbreaks [3,8].

Behavioral factors played a significant role in shaping transmission dynamics during the outbreak. Sharing drinking water with known cholera cases remained independently associated with infection, highlighting the importance of intra-household and close contact transmission pathway. Such behavioral contributors to transmission of cholera outbreaks have been reported in a previous study conducted in Bangladesh [9]. This reflects limited risk perception and constrained access to alternative water sources, which compel households to share unsafe water even during outbreaks. Therefore, these findings emphasize the need for targeted household and community level interventions alongside broader WASH measures.

Conversely, protective behaviors such as handwashing before eating and awareness of cholera were significantly associated with reduced risk of infection. These findings demonstrate the protective effect of hygiene practices and health knowledge in interrupting fecal oral transmission pathway as demonstrated elsewhere [8,10]. Such behaviors reinforcing the importance of community-based health education as core outbreak control strategy.

Strengths and Limitations

Strengths: We employed an unmatched case-control study approach which ensured efficient identification of exposures associated with relatively rare outcome of cholera infection. The approach enabled comparison of multiple potential exposure factors between cases and controls within a short period of time to inform public health measures.

Limitations: The data was collected through interview and the information was self-reported which would lead to recall bias as cases would remember the exposure compared to the controls and this was complemented by observation and verification of sanitation and hygiene practices.

Use of clinical case definition that may lead to misclassification of cases this was mitigated by triangulation of clinical findings with epidemiological link and environmental evidence.

CONCLUSION

This outbreak investigation demonstrates that cholera transmission in Mpwapwa, District Council was primarily driven by unsafe drinking water sources particularly from river Sasima, lack of water treatment, unsafe water-sharing at household level, and inadequate hygiene behaviors. Protective factors such as hand hygiene and cholera awareness significantly reduced infection risk. These findings underscored the need for integrated WASH interventions, sustained community health education, and strengthened outbreak preparedness systems to prevent cholera outbreaks in similar rural settings.

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MUHTASARI

Sababu za Kuenea Maambukizi ya Kipindupindu katika Halmashauri ya Wilaya ya Mpwapwa, Mkoa wa Dodoma, Tanzania (Desemba 2025)

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Utangulizi: Kipindupindu kinaendelea kuwa changamoto ya mara kwa mara ya afya ya jamii nchini Tanzania, hasa katika maeneo yenye upatikanaji mdogo wa huduma salama za maji, usafi wa mazingira na usafi binafsi (WASH). Tarehe 15 Desemba 2025, Halmashauri ya Wilaya ya Mpwapwa mkoani Dodoma iliripoti mlipuko wa kipindupindu uliokuwa umejikita katika Kata ya Malolo. Timu ya kitaifa ya ufuatiliaji kutoka Wizara ya Afya (MoH), Ofisi ya Waziri Mkuu - Tawala za Mikoa na Serikali za Mitaa (PMO-RALG), pamoja na Mpango wa Mafunzo ya Epidemiolojia na Maabara Tanzania (TFELTP), ilifanya uchunguzi wa mlipuko huu ili kubaini chanzo na sababu ya kuenea kwa maambukizi na kuelekeza hatua za kudhibiti.

Mbinu: Utafiti ulifanyika kwa kulinganisha watu waliougua (kisa) na wale ambao hawakuugua (vidhibiti) kwa uwiano wa kisa kimoja kwa vidhibiti watatu waliochaguliwa kwa nasibu. Taarifa za kijamii, kimazingira na kitabia na hali za maisha zilikusanywa kwa njia ya usaili kwa kutumia dodoso sanifu kupitia Kobo Collect. Takwimu zilichambuliwa kwa kutumia programu ya kitakwimu aina ya STATA toleo la 17 kuainisha chanzo na sababu za kuenea kwa kipindupindu. Ramani za kijiografia zilitengenezwa kwa kutumia QGIS toleo la 3.4

Matokeo: Jumla ya watu 148 walijumuishwa, vikiwemo visa 37 na vidhibiti 111, ambapo takwimu za mchoro wa mlipuko ulionyesha chanzo kimoja cha maambukizi. Watoto wenye umri wa miaka 0-14 walichangia idadi kubwa ya visa 15 (asilimia 40.5) ikilinganishwa na vidhibiti 34 (asilimia 30.6). Uchambuzi wa kina ulionyesha kuwa kutotibu maji ya kunywa na kushirikiana maji ya kunywa na mtu aliyeambukizwa zilikuwa sababu kuu kwa kuenea kipindupindu (AOR = 31.0, 95% CI: 2.90-343.28, p = 0.005) na (AOR = 4.5, 95% CI: 1.39-14.47, p = 0.012) mtawalia. Kuosha mikono kabla ya kula na uelewa kuhusu kipindupindu vilikuwa sababu ambazo zilisaidia kuwa kinga muhimu dhidi ya kuenea kwa kipindupindu (AOR = 0.1, 95% CI: 0.01-0.60, p = 0.012) na (AOR = 0.2, 95% CI: 0.06-0.74, p = 0.016) mtawalia. Wakati wa mlipuko, watu takribani 250 walipatiwa elimu ya afya, na kaya 111 zilipatiwa vidonge vya kutibu maji.

Hitimisho: Uchunguzi huu unaonyesha kuwa maambukizi ya kipindupindu katika Halmashauri ya Wilaya ya Mpwapwa yalichangiwa hasa na matumizi ya maji yasiyo salama, hususan kutoka Mto Sasima, kutotibu maji, kushirikiana maji kwa njia isiyo salama katika kaya, na tabia duni za usafi. Sababu kinga kama vile usafi wa mikono na uelewa wa kipindupindu zilipunguza kwa kiasi kikubwa hatari ya maambukizi. Matokeo haya yanasisitiza umuhimu wa kuimarisha afua jumuishi za maji, usafi wa mazingira na usafi binafsi (WASH), kuendeleza elimu ya afya kwa jamii, na kuboresha mifumo ya utayari wa kukabiliana na milipuko ili kuzuia kipindupindu katika maeneo ya vijijini yenye mazingira kama haya.

Maneno Muhimu: Kipindupindu, Mlipuko, Sababu, Uambukizaji, Mpwapwa, Tanzania

REFERENCES

1. Cholera [Internet]. [cited 2025 Dec 27]. Available from: https://www.who.int/health-topics/cholera?utm_source=chatgpt.com#tab=tab_1
2. Cholera | WHO | Regional Office for Africa [Internet]. [cited 2025 Dec 27]. Available from: https://www.afro.who.int/health-topics/cholera
3. Ali M, Nelson AR, Lopez AL, Sack DA. Updated Global Burden of Cholera in Endemic Countries. PLoS Negl Trop Dis [Internet]. 2015 Jun 4 [cited 2025 Dec 27];9(6):e0003832. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC4455997/

4. Cholera in the WHO African Region: Weekly Regional Cholera Bulletin: 3 July 2023 | WHO | Regional Office for Africa [Internet]. [cited 2025 Dec 27]. Available from: https://www.afro.who.int/countries/democratic-republic-of-congo/publication/cholera-who-african-region-weekly-regional-cholera-bulletin-3-july-2023
5. The United Republic of Tanzania Ministry of Health @2022 Edition.
6. Torokaa PR, Njau A, Kimambo J, Urio L, Muchunguzi V, Makala R, et al. Cholera outbreak in Hanang District, Manyara, Tanzania, July 2024: An unmatched case-control study. Journal of Interventional Epidemiology and Public Health. 2025;8.
7. Tanzania: Cholera Outbreak - DREF Final Report (MDRTZ037) - United Republic of Tanzania | ReliefWeb [Internet]. [cited 2026 Jan 8]. Available from: https://reliefweb.int/report/united-republic-tanzania/tanzania-cholera-outbreak-dref-final-report-mdrtz037
8. Freeman MC, Stocks ME, Cumming O, Jeandron A, Higgins JPT, Wolf J, et al. Hygiene and health: systematic review of handwashing practices worldwide and update of health effects. Trop Med Int Health [Internet]. 2014 [cited 2025 Dec 28];19(8):906–16. Available from: https://pubmed.ncbi.nlm.nih.gov/24889816/
9. George CM, Hasan K, Monira S, Rahman Z, Saif-Ur-Rahman KM, Rashid MU, et al. A prospective cohort study comparing household contact and water Vibrio cholerae isolates in households of cholera patients in rural Bangladesh. PLoS Negl Trop Dis. 2018 Jul 27;12(7).
10. Curtis V, Cairncross S. Effect of washing hands with soap on diarrhoea risk in the community: A systematic review. Lancet Infectious Diseases [Internet]. 2003 May 1 [cited 2025 Dec 28];3(5):275–81. Available from: https://pubmed.ncbi.nlm.nih.gov/12726975/

Magnitude of Rotavirus Diarrhea among Children in Ruvuma Region, Tanzania: A 2022 Outbreak

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ABSTRACT

Introduction: Diarrhea is the third leading cause of mortality among children under five, accounting for approximately 1.7 billion cases and 443,832 deaths globally each year. In Tanzania, rotavirus contributed to 72% of diarrhea-related deaths in children under five prior to vaccine introduction in 2008. Following the introduction of the rotavirus vaccine in 2013, mortality declined by about 50% (from 72% to 36%). On October 19, 2022, a media report on unusual increase in pediatric diarrhea cases at Songea Regional Referral Hospital prompted an outbreak investigation in the Ruvuma region.

Methodology: A cross-sectional, descriptive, hospital-based study was conducted among aged 1-59 months presenting with diarrhea in four district councils (Mbinga, Nyasa, Tunduru, and Songea) in the Ruvuma region between September and October 2022. Stool samples were collected, transported analyzed at Songea Regional Referral Hospital Laboratory. However, for culture and antibiotic sensitivity testing was confirmed at the National Public Health Laboratory. Microsoft Excel software was used for data analysis.

Results: A total of 538 diarrhea cases were reported during the study period (September to October 2022) with majority (224; 41.6%) from Songea Municipal Council. Infants aged ≤1 year accounted for the majority of cases (359; 66.7%). Of 32 stool samples collected and analyzed, 18 (56.2%) tested positive for Rotavirus by ELISA, while 1 (3.1%) was positive for *Salmonella typhi*.

Conclusion: Rotavirus was the primary cause of the outbreak in the Ruvuma region, underscoring its continued public health importance despite vaccine introduction. Strengthened surveillance system, including establishment of sentinel sites are essential for early outbreak detection and monitoring circulating strains. Improving vaccine coverage, ensuring adherence to recommended schedules, and maintaining an effective cold chain are critical to sustaining vaccine impact. In addition, enhanced laboratory-based surveillance is needed to monitor circulating genotypes and evaluate the long-term effectiveness of the rotavirus vaccination in Tanzania since its introduction in 2013. Collectively, these measures are key to enhancing rotavirus control and reducing the burden of diarrheal disease among children in Tanzania.

Keywords: Children, Diarrhea, Rotavirus, Tanzania

INTRODUCTION

Diarrhea is the third leading cause of mortality in children under five years globally, it accounts for an average of 1.7 billion cases and 443,832 deaths each year [1]. Up to 25% of deaths in young children living in Africa and Southeast Asia are attributable to acute gastroenteritis, and the youngest children are most vulnerable [2].

Diarrhea is caused by a wide range of etiological agents which include enteric adenovirus (serotypes 40 and 41), Rotavirus, *Entamoeba histolytica* (amoebiasis), *Cryptosporidium spp* (cryptosporidiosis), *Shigella* spp. (Shigellosis), *Vibrio cholerae* (cholera), *Clostridium difficile*, *Aeromonas spp*, *Campylobacter spp* (enteritis), non-typhoidal *Salmonella spp, typical enteropathogenic Escherichia coli* (tEPEC), *enterotoxigenic E coli* (ETEC; both ST and LT) [3].

However, Rotavirus is one of the most common causes of diarrhea and one of the major causes of severe gastroenteritis in under five children. Several studies have shown that at least 30–60% of hospital admissions for acute gastroenteritis in young children are the result of rotavirus infection [4]. Rotavirus is a double-stranded RNA virus belonging to the family Reoviridae. The virus is composed of three concentric shells that enclose 11 gene segments. The outermost shell contains two important proteins: VP7, or G-protein, and VP4, or P-protein which play a big role in inducing neutralizing antibodies for body immune protection. There are five genotypes of rotavirus (G1P, G2P, G3P, G4P, and G9P) that accounted for 90% of strains isolated from children below 5 years in the United States [5]. Of these, genotypes G1P and G12P have become the most common genotypes identified in the United States [5]. Rotavirus can remain viable outside the human body from several hours to several months, based on the environment conditions.

The ideal environment for its survival consists of low pH (~3), low temperature (4–20°C), and low humidity and protection from ultraviolet radiation [4]. In stool, rotavirus is found to be very stable at low and high relative humidity but not in the medium range of relative humidity [4]. Rotavirus infectivity is lost more rapidly at 37°C than at 4°C or 20°C [6]. Even at ambient temperatures above 30°C rotavirus particles stored in feces are stable and may be infectious in vitro after 2.5 months of storage [7]. The VP7 and VP4 proteins define virus serotype and induce neutralizing antibodies which G1 and G12 strains account for most infections and are very stable and may remain viable for weeks or months if not disinfected [5].

Despite improvements in standard of living, advances in sanitation, water treatment, and food safety awareness, diarrheal disease still accounts for significant economic and societal losses [8]. In Tanzania, rotavirus infections are responsible for 72% of diarrhea deaths in children under five of age [9]. A study by Fausta et al in 2023 showed a significant decrease in Rotavirus positivity from 29.3% to 17.8% from 2013 to 2018 after the introduction of the vaccine in Tanzania [10]. Nevertheless, rotavirus outbreaks and hospital clusters may still occur in the vaccine era due to factors such as sub-optimal vaccine coverage, delayed or missed doses, cold-chain and service delivery gaps, and the circulation of heterologous genotypes [10,11,12]. However, on October 19, 2022 at 8:00 pm, it was reported from the independent television (ITV) news bulletin about the admitted cases with diarrhea and vomiting from Songea Regional Referral Hospital in Ruvuma region. Hence, an outbreak investigation was conducted to determine the etiology and the magnitude of diarrhea among children in the Ruvuma region.

METHODOLOGY

Study Design, Area and Settings

A cross-sectional descriptive hospital-based study was conducted at Ruvuma region in children aged 1 month to 5 years. Ruvuma region is a Southern Highlands region with five districts namely Songea, Tunduru, Namtumbo, Nyasa, and Mbinga in Tanzania with an area of 63,669 km^2. Four affected district councils of the Ruvuma region were involved in the study; Mbinga, Nyasa, Tunduru, and Songea from September to October 2022.

Study Population and Inclusion Criteria

All children with diarrhea and vomiting were included in the study.

Laboratory Investigations

Stool specimens from hospitalized children with diarrhea were collected and transported to the laboratory in labeled and securely closed containers. A stool culture was done at Songea Regional Referral Hospital Laboratory and the results were given to clinicians immediately for patient management. The specimens were further tested for rotavirus antigens using the rotavirus ELISA detection kit at the National Public Health Laboratory. The samples were stored in a refrigerator at 2-8°C before testing.

Culture and Identification of Microorganisms

Stool samples were cultured in a selected media and incubated at 37°C for 18 hours. The media used included Thiosulfate-Citrate-Bile Salts Sucrose (TCBS) agar, MacConkey agar (MCA), Xylose Lysine Deoxycholate (XLD) agar, and Blood agar (BA) [13]. The isolate was subsequently subjected to antimicrobial susceptibility testing by using the Kirby-Bauer method.

Rotavirus Antigen Detection

Sample detection of Rotavirus in stool was done by enzyme linked immunoassay (Micro Read 1000 ELISA Plate Analyzer, BELGIUM) at the National Public Health Laboratory [14]

Data Collection and Analysis

A line list and laboratory investigation forms were used to collect socio-demographic data on children with diarrhea. Stool samples were collected and transported to the clinical laboratory for bacterial culturing and enzyme-linked immunoassay for the detection of rotavirus. Descriptive statistics were used to summarize the data. Tables, graphs, and charts were used to present data using Microsoft Excel.

Ethical Clearance and Permission

As this was an outbreak investigation, permission to publish was sought and granted by the Ministry of Health, Tanzania (Ref. No. CA. 209/248/01 dated April 8, 2026). A laboratory identification number was used to ensure confidentiality.

RESULTS

Distribution and Magnitude of Diarrhea and Vomiting Cases by Sociodemographic Characteristics

Among the 538 reported cases of diarrhea, a slight male predominance was observed 278 (51.7%). Infants aged ≤1 year accounted for the majority of cases 359 (66.7%), indicating the highest burden in early childhood. Most cases were concentrated in Songea Municipal Council 224 (41.6%) and Tunduru District Council 178 (33.1%), reflecting a geographic clustering of transmission (Table 1).

Table 1: Distribution and Magnitude of Diarrhea and Vomiting Cases by Sociodemographic Characteristics in the Ruvuma Region (N= 538)

Variables	Frequency	Percentage (%)
Sex		
Male	278	51.7
Female	260	48.3
Age-group		
≤1y	359	66.7
1 - 2yrs	128	23.8
3 - 4yrs	42	7.8
≥5yrs	9	1.7
Councils		
Mbinga Town Council	22	4.1
Nyasa District Council	114	21.2
Tunduru District Council	178	33.1
Songea Municipal Council	224	41.6

Epidemiologic Findings

The epidemic curve shows a progressive increase in incident cases, beginning with a few cases in late September and a gradual rise in early October. Transmission intensified in mid-October, with a sharp increase in cases peaking around 20-21October (approximately 29 to 30 cases per day). After the peak, the number of cases declined steadily with minor fluctuations toward the end of October, suggesting a reduction in transmission and possible impact of response or control measures. The overall temporal pattern is consistent with a propagated outbreak, characterized by a progressive rise and fall in cases over time, reflecting person-to-person transmission rather than a single common source exposure (Figure 1).

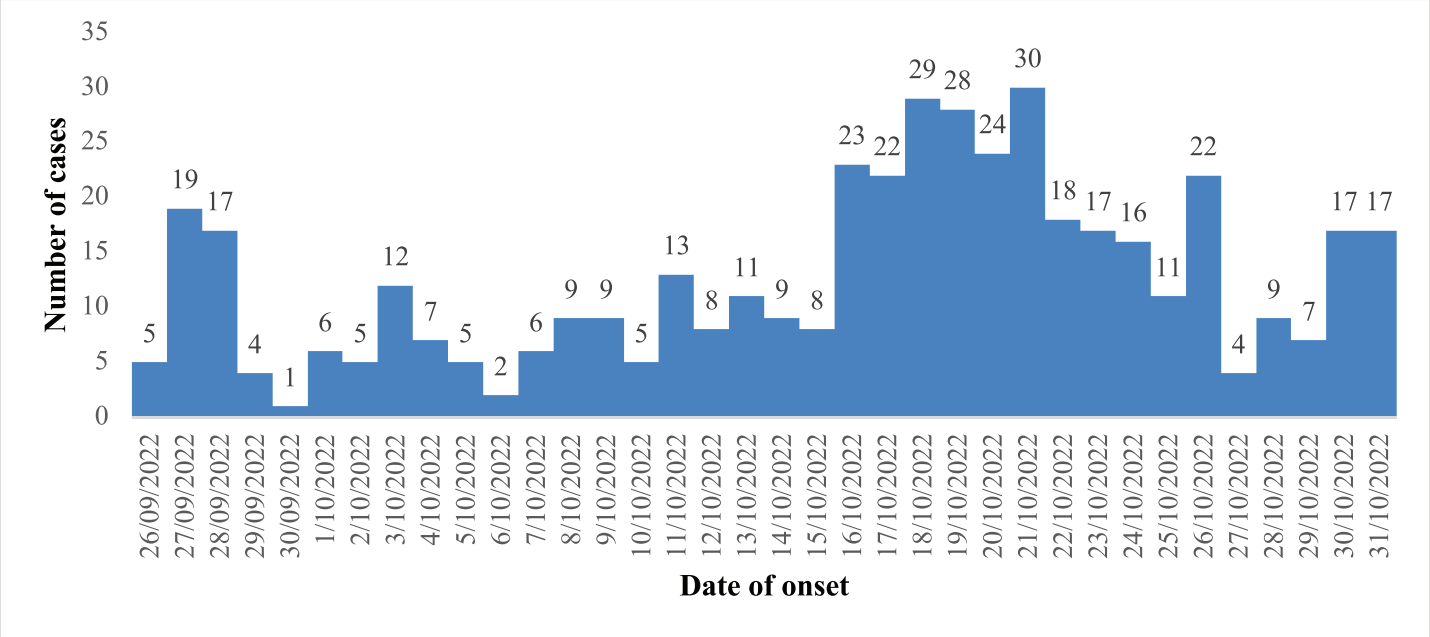

Figure 1: Epidemic Curve of Diarrhea and Vomiting Cases in Ruvuma region from September 26, - October 31, 2022.

Laboratory Findings

Stool Culture and Rotavirus ELISA Tests

A total of 32 stool samples were tested for culture and rotavirus. Of 18 (56.2%) samples were ELISA positive for Rotavirus whereby 1(3.1%) sample that yielded *Salmonella typhi* and was sensitive to ciprofloxacin and chloramphenicol and resistant to ampicillin, cephalothin and tetracycline (Table 2).

Table 2. Distribution of Cases by Sex, Age, and Rotavirus Results in Ruvuma Region, October 2022.

Variables	Frequency	Percentage (%)
Sex		
Male	13	40.6
Female	19	59.4
Age groups		
<1y	11	34.4
1-2y	19	59.4
3-4y	2	6.2
ROT ELISA results		
Positive	18	56.2
Negative	14	43.8

DISCUSSION

This study identified Rotavirus as the primary cause of the diarrhea and vomiting outbreak among children in the Ruvuma region, with a prevalence of 56.2%. This estimate is lower than the previous reports indicating that rotavirus account for up to 72% of diarrhea-related deaths among children under five in Tanzania [9].

Globally, rotavirus remains a leading cause of morbidity and mortality, particularly in sub-Saharan Africa, where nearly half of the estimated 197,00-233,000 annual deaths in children under five occur [4,15]. However, the introduction of rotavirus vaccines has significantly reduced disease burden. In Tanzania, hospital-based studies have shown a decline in rotavirus prevalence from pre-vaccination levels of up to 58% to as low as 16-18% in post-vaccination period across regions such as Mwanza, Tanga, Mbeya and Dar es Salaam [16-18]. Similar reductions have been reported in other settings.

Regional studies in East Africa show variable prevalence. In Kenya, rotavirus prevalence has ranged widely from 11-59% [20-22], with more recent estimates around 31.5% [19], while Uganda reported a prevalence of 45.4% [20,23]. The findings from this study are comparable to the higher end of these regional estimates.

Consistent with global evidence, rotavirus infection in this study predominantly affected younger children [24], with 93.8%

of cases occurring in those under 24 months. This aligns with studies from low-income settings such as Kenya and Uganda [20,23], Nigeria, Sudan, Malawi, and India [25-28], where the highest burden is observed in children under one year of age, often within the first six months of life.

Although stool culture identified *Salmonella typhi,* antimicrobial susceptibility testing showed sensitivity to ciprofloxacin and chloramphenicol, and resistance to ampicillin, cephalothin, and tetracycline. These results informed clinical management. However, as rotavirus was confirmed cause of the outbreak, antibiotic treatment is not indicated. Management should primarily focus on supportive care, particularly oral rehydration therapy [29]

Rotavirus remains the leading cause of severe gastroenteritis in young children worldwide. Control measures include improved sanitation, good hygiene, and vaccination, with vaccination being the most effective control measures [5, 30]. Continuous surveillance of circulating rotavirus strains is essential to monitor Epidemiological trends and assess vaccine effectiveness

Study limitation

The study employed a cross-sectional, descriptive hospital-based design without a control group (e.g. non-diarrheal admissions or community controls), limits the ability to assess risk factors or establish association (odds ratios) between exposures (e.g. water source, hygiene, vaccination status) and rotavirus infection.

CONCLUSION

Rotavirus was the primary cause of the outbreak in the Ruvuma region, underscoring its continued public health importance despite vaccine introduction. Strengthened surveillance system, including establishment of sentinel sites are essential for early outbreak detection and monitoring circulating strains. Improving vaccine coverage, ensuring adherence to recommended schedules, and maintaining an effective cold chain are critical to sustaining vaccine impact. In addition, enhanced laboratory-based surveillance is needed to monitor circulating genotypes and evaluate the long-term effectiveness of the rotavirus vaccination in Tanzania since its introduction in 2013. Collectively, these measures are key to enhancing rotavirus control and reducing the burden of diarrheal disease among children in Tanzania.

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MUHTASARI

Ukubwa wa Tatizo la Kuhara Unaosababishwa na Rotavirus Miongoni mwa Watoto katika Mkoa wa Ruvuma, Tanzania: Mlipuko wa Mwaka 2022

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Utangulizi: Kuhara ni sababu ya tatu inayoongoza kwa vifo miongoni mwa watoto wenye umri chini ya miaka mitano, ikiwa inachangia takribani visa bilioni 1.7 na vifo 443,832 duniani kila mwaka. Nchini Tanzania, virusi vya rotavirus vilichangia asilimia 72 ya vifo vinavyohusiana na kuhara kwa watoto chini ya miaka mitano kabla ya kuanzishwa kwa chanjo mwaka 2008. Kufuatia kuanzishwa kwa chanjo ya rotavirus mwaka 2013, vifo vilipungua kwa takribani asilimia 50 (kutoka 72% hadi 36%). Tarehe 19 Oktoba 2022, taarifa ya vyombo vya habari kuhusu ongezeko lisilo la kawaida la visa vya kuhara kwa watoto katika Hospitali ya Rufaa ya Mkoa wa Songea ilisababisha uchunguzi wa mlipuko wa ugonjwa katika mkoa wa Ruvuma.

Mbinu: Utafiti huu ulitumia muundo wa mkato(cross-sectional study design) uliofanyika hospitalini kwa watoto wenye umri wa miezi 1–59 waliokuwa na dalili za kuhara katika halmashauri nne za wilaya (Mbinga, Nyasa, Tunduru, na Songea) katika mkoa wa Ruvuma kati ya Septemba na Oktoba 2022. Sampuli za kinyesi zilikusanywa, kusafirishwa kwenda katika Maabara ya Hospitali

ya Rufaa ya Mkoa wa Songea ajili ya uchunguzi. Hata hivyo, vipimo vya uoteshaji wa vimelea (culture) na usikivu wa dawa za antibiotiki(antimicrobial susceptibility testing) vilithibitishwa katika Maabara ya Taifa ya Afya ya Jamii. Programu ya Microsoft Excel ilitumika kwa uchambuzi wa data.

Matokeo: Jumla ya visa 538 vya kuhara viliripotiwa katika kipindi cha utafiti (Septemba hadi Oktoba 2022), ambapo wengi (224; 41.6%) walitoka Halmashauri ya Manispaa ya Songea. Watoto wachanga wenye umri wa chini ya mwaka 1 walichangia idadi kubwa ya visa (359; 66.7%). Kati ya sampuli 32 za kinyesi zilizopimwa, 18 (56.2%) zilipatikana na maambukizi ya rotavirus kwa kutumia kipimo cha ELISA, huku 1 (3.1%) ikiwa na *Salmonella typhi*.

Hitimisho: Rotavirus ilikuwa sababu kuu ya mlipuko katika mkoa wa Ruvuma, jambo linaloonyesha umuhimu wake katika afya ya jamii licha ya kuanzishwa kwa chanjo. Kuimarisha mfumo wa ufuatiliaji, ikiwa ni pamoja na kuanzisha vituo teule (sentinel sites), ni muhimu kwa utambuzi wa mapema wa milipuko na ufuatiliaji wa aina za vimelea vinavyozunguka nchini. Kuboresha kiwango cha chanjo, kuhakikisha ufuataji wa ratiba zilizopendekezwa, na kudumisha mfumo bora wa mnyororo baridi (cold chain) ni mambo muhimu katika kudumisha ufanisi wa chanjo. Aidha, ufuatiliaji ulioimarishwa wa maabara (laboratory-based surveillance) unahitajika ili kufuatilia vinasaba (genotype) zinazozunguka na kutathmini ufanisi wa muda mrefu wa chanjo ya rotavirus nchini Tanzania tangu kuanzishwa kwake mwaka 2013. Kwa ujumla, hatua hizi ni muhimu katika kuimarisha udhibiti wa rotavirus na kupunguza mzigo wa magonjwa ya kuhara miongoni mwa watoto nchini Tanzania.

Maneno Muhimu: Kuhara, Watoto, Rotavirus, Tanzania

REFERENCES

1. World Health Organization. Diarrhoeal disease: fact sheet. Geneva: World Health Organization; 2024. Available from: https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease (accessed on December 2022).
2. Sidoti F, Rittà M, Costa C, Cavallo R. Diagnosis of viral gastroenteritis: limits and potential of currently available procedures. The Journal of Infection in Developing Countries. 2015 Jul 4;9(06):551-61.
3. Troeger C, Forouzanfar M, Rao PC, Khalil I, Brown A, Reiner RC et al. Estimates of global, regional, and national morbidity, mortality, and aetiologies of diarrhoeal diseases: a systematic analysis for the Global Burden of Disease Study 2015. The Lancet infectious diseases. 2017 Sep 1;17(9):909-48.
4. D'souza RM, Hall G, Becker NG. Climatic factors associated with hospitalizations for rotavirus diarrhoea in children under 5 years of age. Epidemiology & Infection. 2008 Jan;136(1):56-64.
5. Margaret M & Penina Haber, 2021. https://www.cdc.gov/vaccines/pubs/pinkbook/rota.html(accessed on December 2022)
6. Moe K, Shirley JA. The effects of relative humidity and temperature on the survival of human rotavirus in faeces. Archives of virology. 1982 Sep;72(3):179-86.
7. Fischer TK, Steinsland H, Valentiner-Branth P. Rotavirus particles can survive storage in ambient tropical temperatures for more than 2 months. Journal of clinical microbiology. 2002 Dec;40(12):4763-4.
8. Reddington K, Tuite N, Minogue E, Barry T. A current overview of commercially available nucleic acid diagnostics approaches to detect and identify human gastroenteritis pathogens. Biomolecular detection and quantification. 2014 Sep 1;1(1):3-7.
9. Malakalinga JJ, Misinzo G, Msalya GM, Kazwala RR. Rotavirus burden, genetic diversity and impact of vaccine in children under five in Tanzania. Pathogens. 2019 Oct 29;8(4):210.
10. Michael F, Mirambo MM, Lyimo D, Salehe A, Kyesi F, Msanga DR et al. Rotavirus genotype diversity in Tanzania during Rotavirus vaccine implementation between 2013 and 2018. Scientific Reports. 2023 Dec 8;13(1):21795.
11. Burke RM, Tate JE, Han GS, Quenelle R, Gautam R, Wadford DA et al. Rotavirus vaccination coverage during a rotavirus outbreak resulting in a fatality at a subacute care facility. Journal of the Pediatric Infectious Diseases Society. 2020 Jul;9(3):287-92.
12. Kishimoto K, Kunisawa S, Fushimi K, Imanaka Y. Effects of Rotavirus Vaccination Coverage among Infants on Hospital Admission for Gastroenteritis across All Age Groups, Japan, 2011–2019. Emerging infectious diseases. 2024 Sep;30(9):1895.
13. Bopp Cheryl A, Ries Alley Arthur, Wells, Joy G. Laboratory Methods for the Diagnosis of Epidemic Dysentery and Cholera. Centers for Disease Control and Prevention Atlanta, Georgia 1999.
14. ProSpect Rotavirus Microplate Assay Instruction Manual. https://assets.fishersci.com/TFS-Assets/MBD/Instructions/X7596C.pdf.
15. Tate JE, Burton AH, Boschi-Pinto C, Parashar UD, Agocs M, Serhan F et al. Global, regional, and national estimates of rotavirus mortality in children< 5 years of age, 2000–2013. Clinical Infectious Diseases. 2016 May 1;62(suppl_2):S96-105.
16. Jani B, Hokororo A, Mchomvu J, Cortese MM, Kamugisha C, Mujuni D et al. Detection of rotavirus before and after monovalent rotavirus vaccine introduction and vaccine effectiveness among children in mainland Tanzania. Vaccine. 2018 Nov 12;36(47):7149-56.
17. Hokororo A, Kidenya BR, Seni J, Mapaseka S, Mphahlele J, Mshana SE. Predominance of rotavirus G1 [P8] genotype among under-five children with gastroenteritis in Mwanza, Tanzania. Journal of tropical pediatrics. 2014 Oct 1;60(5):393-6.
18. Temu MM, Changalucha JM, Mngara JT, Steele AD. Prevalence of rotavirus infections and strain types detected among under-five children presenting with diarrhoea at selected MCH clinics in Mwanza City, Tanzania. Tanzania Journal of Health Research. 2002;4(2):30-2.

19. Agutu MT, Ongus J, Kombich J, Kamenwa R, Nyangao J, Kagira J et al. Prevalence and genetic diversity of rotavirus infection in children with acute gastroenteritis in a hospital setting, Nairobi Kenya in post vaccination era: a cross-sectional study. Pan Afr Med J. 2017 Jan 24;26:38.
20. Kiulia NM, Kamenwa R, Irimu G, Nyangao JO, Gatheru Z, Nyachieo A et al. The epidemiology of human rotavirus associated with diarrhoea in Kenyan children: a review. Journal of tropical pediatrics. 2008 Dec 1;54(6):401-5.
21. Gatinu BW. Prevalence of group A rotavirus and electrolyte profiles in children presenting with acute diarrhea at KNH. Nairobi: University of Nairobi. 2007.
22. Apondi EW, Omondi JV, Ichinose Y. Detection and molecular characterization of rotavirus strains isolated from children attending selected health facilities in Kiambu district, Kenya. Reterieved from: https://pdfs. semanticscholar. org/bada/1f520e95041b539336e991226 04df88438b0. pdf. 2012 Oct.
23. Nakawesi JS, Wobudeya E, Ndeezi G, Mworozi EA, Tumwine JK. Prevalence and factors associated with rotavirus infection among children admitted with acute diarrhea in Uganda. BMC pediatrics. 2010 Sep 24;10(1):69.
24. Parashar UD, Gibson CJ, Bresee JS, Glass RI. Rotavirus and severe childhood diarrhea. Emerging infectious diseases. 2006 Feb;12(2):304.
25. Tagbo BN, Mwenda JM, Armah G, Obidike EO, Okafor UH, Oguonu T et al. Epidemiology of rotavirus diarrhea among children younger than 5 years in Enugu, South East, Nigeria. The Pediatric infectious disease journal. 2014 Jan 1;33:S19-22.
26. Mustafa A, Makki A, Siddig O, Haithami S, Teleb N, Trivedi T et al. Baseline burden of rotavirus disease in Sudan to monitor the impact of vaccination. The Pediatric infectious disease journal. 2014 Jan 1;33:S23-7.
27. Bar-Zeev N, Kapanda L, Tate JE, Jere KC, Iturriza-Gomara M, Nakagomi O et al. Effectiveness of a monovalent rotavirus vaccine in infants in Malawi after programmatic roll-out: an observational and case-control study. The Lancet infectious diseases. 2015 Apr 1;15(4):422-8.
28. Gladstone BP, Ramani S, Mukhopadhya I, Muliyil J, Sarkar R, Rehman AM et al. Protective effect of natural rotavirus infection in an Indian birth cohort. New England Journal of Medicine. 2011 Jul 28;365(4):337-46.
29. Liu L, Johnson HL, Cousens S, Perin J, Scott S, Lawn JE et al. Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. The lancet. 2012 Jun 9;379(9832):2151-61.
30. Fischer TK, Viboud C, Parashar U, Malek M, Steiner C, Glass R et al. Hospitalizations and deaths from diarrhea and rotavirus among children< 5 years of age in the United States, 1993–2003. The Journal of infectious diseases. 2007 Apr 15;195(8):1117-25.

Management of Extensive Burn Injuries Using Tilapia Skin Xenograft in a Resource-Limited Setting: A Case Report from Mererani Health Centre, Manyara Region, Tanzania

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ABSTRACT

Introduction: Burns injuries remain a major global health challenge, particularly in low- and middle -income countries where access to advanced wound care is limited. Innovative and affordable treatment option are essential to improve patient outcomes in resource-constrained setting such as Tanzania. Recent clinical trials have demonstrated the potential of Nile Tilapia *(Oreochromis niloticus)* skin as a promising biological dressing, demonstrating its ability to enhance wound healing through rapid epithelialization. This study, conducted at Mererani Health Centre, Manyara Region, is the first to evaluate the clinical efficacy and the wound healing potential of processed tilapia skin in patients with superficial and deep partial-thickness burns.

Case Presentation: We report the case of a 26-years-old male who sustained deep burns involving approximately 40% of the total body surface area following a gas cooker explosion. His clinical course was complicated by delayed care, septicemia, and pulmonary tuberculosis due to socioeconomic constraints and healthcare access challenges.

Laboratory Investigation: Laboratory findings revealed anemia (hemoglobin 10g/dL), normal random blood glucose (4.5 mmol/L), negative malaria parasite, and a positive GeneXpert results for tuberculosis

Treatment and Outcome: The patient received intravenous antibiotics for septicemia and was initiated on standard anti-tuberculosis therapy. Due to financial limitations, processed Nile tilapia skin was applied as a biological dressing. The intervention demonstrated good adherence to the wound bed, reduced frequency of dressing changes, minimized pain, and produced re-epithelialization. The patient showed significant clinical improvement and was discharged after 14 days with stable condition, and *no adverse effects were noted.*

Conclusion: This case demonstrates that processed Nile tilapia *(Oreochromis niloticus)* skin is an effective low-cost biological dressing for burn management in resources-limited settings. Its application was associated with accelerated wound healing, reduced pain, and improved patient comfort by minimizing procedural trauma and the need for frequent dressing changes. Furthermore, the accessibility and affordability of tilapia skin make it a practical alternative to conventional synthetic and animal -derived dressing, particularly in resource-constrained healthcare settings. This approach may help address gaps in burn care where standard treatments are either unavailable or unaffordable.

Keywords: Burn Injuries, Tilapia Skin, Xenograft, Marerani, Tanzania

INTRODUCTION

Burn injuries pose a significant threat to life and often require prolonged care, resulting in substantial physical and emotional suffering along with economic burdens. They are a major contributor to skin damage worldwide, accounting for nearly 300,000 death global fatalities annually [1]. Traditional burn wound management primarily relies on the use of silver sulfadiazine or frequent dressing changes, both of which can be painful and costly [2,3]. In many cases, anesthesia is required during dressing changes to alleviate patient discomfort [3].

Overtime, burn care has advanced considerably through global efforts to develop more effective, accessible, and cost-effective treatment methods, including innovative wound dressing techniques. Recent clinical trials have demonstrated the potential of Nile Tilapia (Oreochromis niloticus) skin as a promising biological dressing, demonstrating its ability to enhance wound healing through rapid epithelialization [4].

Studies conducted in Brazil have shown that tilapia skin is a cost-effective xenograft, particularly for the treatment of second- and third-degree burns [5]. Tilapia skin is rich in collagen and exhibits structural similarities to human skin. When properly sterilized, it maintains a moist wound environment, reduces pain, accelerates healing, and lowers infection rates compared to conventional gauze dressing [4,6].

Therefore, the use of tilapia skin represents a promising and affordable biological alternative for burn management in low- and middle-income countries, including. This study, conducted at Mererani Health Centre, Manyara Region, is the first to evaluate the clinical efficacy and the wound-healing potential of processed tilapia skin in patients with superficial and deep partial-thickness burns. Written informed consent was obtained from the patient for publication of this case report and accompanying images.

CASE PRESENTATION

Patient information: A 26-years old male presented to Mererani Health Center outpatient department on December 11, 2025, with a history of burn injuries sustained on September 25, 2025 in Dar es Salaam following a gas cooker explosion. He was initially admitted at Mwananyamala Regional Referral Hospital where he received inpatient for four months.

Following discharge, he continued outpatient wound dressing; however, his condition progressively worsened. He was referred to Muhimbili National Hospital for further management but was unable to attend due post-general election violence October 2025. Owing to unstable situation in Dar es Salaam, the patient relocated to his home village in Mererani, Manyara Region, to seek safety and continue medical care.

Presenting symptoms: The patient presented with purulent discharge from the sites involving the chest, both upper limbs, and the head. The wounds had not been dressed for 2 weeks due to the instability in Dar es Salaam.

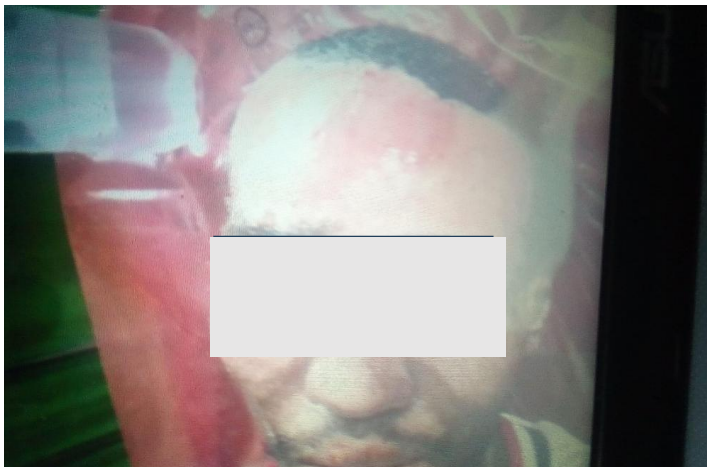

Image 1: Patient arrived Mererani Health Centre due to deep burn injury wounds

Clinical findings: On physical examination, extensive deep burns wounds were observed over the chest, bilateral upper limbs, and head. The burns involved approximately 40% of the total body surface area, as estimated using the Lund and Browder chart [7], with evidence of infection characterized by purulent discharge.

Diagnostic Tests and Results: Blood samples were collected for full blood picture (FBP), malaria testing using a Malaria Rapid Diagnostic Test (mDRT), and random blood glucose (RBG). Sputum was also collected and analyzed using GeneXpert testing for tuberculosis (TB). The results showed that he had no malaria parasite, hemoglobin 10g/dL, and RBG was 4.5mmol/L, and was positive for TB

Diagnosis: The patient was diagnosed with severe deep burns involving 40% of the total body surface area, complicated by septicemia

Treatment/intervention

Management of Septicemia: The patient was immediately initiated with intravenous antibiotics including Metronidazole 500mg, given intravenously, every eight hours for 3 days, Ceftriaxone 1gm given intravenously twice a day for 3days and Diclofenac injecting 150mg given intermuscular stat then tablets 50mg orally three times a day for 5 days.

Management of Tuberculosis: Anti-tuberculosis therapy was initiated according to standard treatment guidelines for duration of six months.

Burn Wounds Management: Initially the patient continued with conventional gauze wound dressing. However, due to financial constraints, he was unable to sustain the cost of regular dressing, including Vaseline gauze. This led to the consternation and subsequent use of tilapia skin as a xenograft.

Tilapia skin was harvested post-mortem after the fish has been caught and was processed under sterile conditions [8]. Briefly, the preparation involved:

1. Washing the skin with cold running water to remove impurities, including excess fat, blood, and fibers.
2. Rising with sterile saline
3. Immersion in 0.25% glutaraldehyde solution
4. Sterilization in 20% alcohol for 24 hours
5. Rinsing again with sterile saline
6. Preservation in 30% glycerin solution to allow for calibration
7. Drying for 72 hours at room temperature in a clean environment
8. Cutting into appropriate sizes and packaging in sterile bandages
9. Storage in vacuum-sealed bags until use

The prepared tilapia skin was applied directly to burn wounds by peeling it off the bandage under strict infection prevention and control (IPC) measures (see image 2).

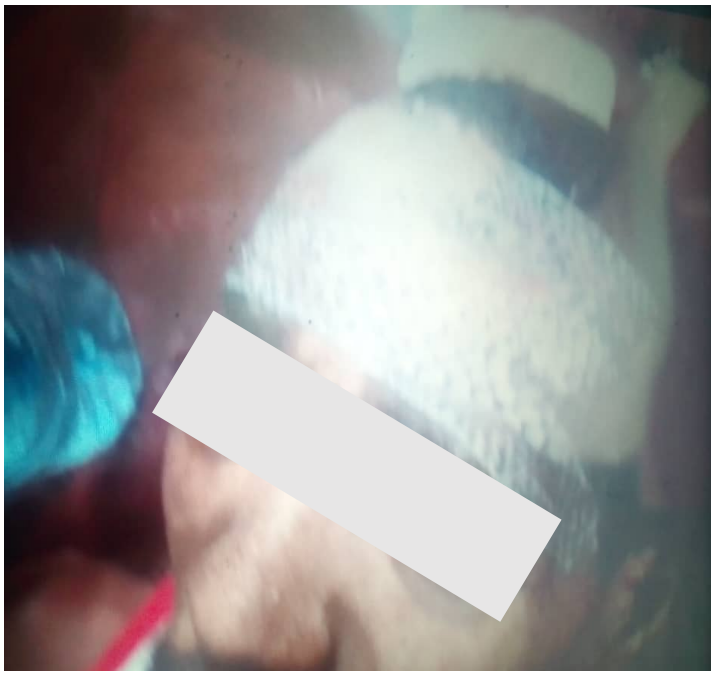

Image 2: Patient appearance after the application of the processed tilapia skin fish

Outcome and follow-up

The tilapia skin demonstrated good adherence to the wound bed and significantly reduced the frequency of dressing changes without the need for anaesthetics. The patient reported minimal pain during treatment, improved comfort and satisfaction with treatment, particularly due to reduced need for frequent dressing changes which were also costly. Progressive re-epithelization was observed, and the patient showed marked clinical improvement. He was discharged on January 10, 2026 after 14 days of admission, with continued outpatient follow-up (see Image 3 and 4).

Image 3: Patient appearance after 10 days of skin tilapia fish application

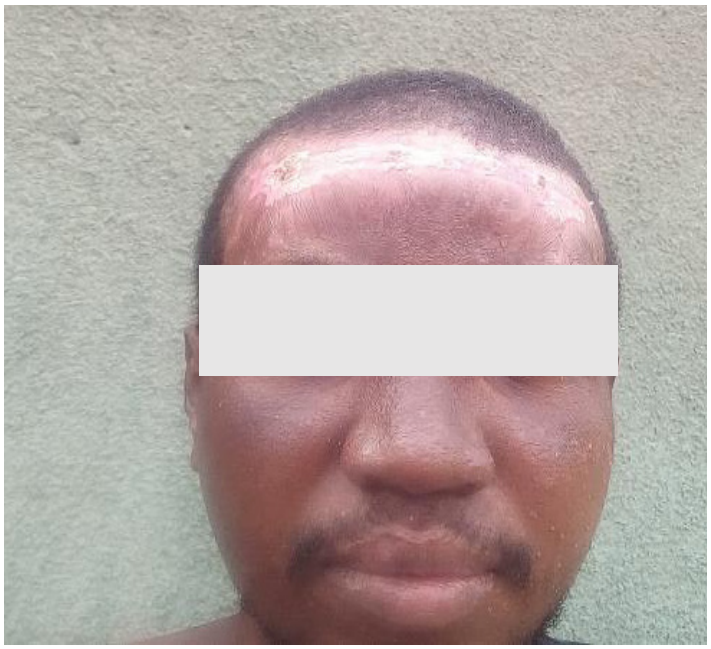

Image 4: Patient appearance at discharge

DISCUSSION

This case demonstrates the successful use of tilapia skin xenograft in managing extensive burns in a resource-limited setting. Our findings are in line with studies conducted in Brazil, where tilapia skin has shown to promote faster epithelization, reduce pain, and reduce the need for frequent dressing changes [4,5].

Tilapia skin's effectiveness is particularly attributed to its high type I and II collagen contents, along with omega-3, and morphological similarity to human skin, which enhances wound healing and provides a protective barrier against infection [6]. Unlike conventional treatment with silver sulfadiazine gauze dressings, which require frequent changes and often causes significant pain, tilapia skin adheres firmly to the wound bed, reducing the number of dressing changes required and improving patient comfort [4,6].

In this case, the benefits were particularly evident given the patient's socioeconomic constraints. The inability to afford standard dressing is a common challenge in low-income settings, often leading to poor outcomes. The use of tilapia skin provided a low-cost, locally available alternative that significantly improved care delivery. This provided benefits for the patient and also for healthcare workers, by reducing the overall workload

Additionally, the patient's delayed care due to civil unrest highlights the vulnerability of healthcare systems to external disruptions. In such contexts, innovative and accessible solutions like tilapia skin become even more critical.

Compared to other biological dressing such as cadaveric skin or synthetic substitutes, tilapia skin offers several advantages, including affordability, ease of preparation, and minimal risk of disease transmission when properly sterilized [9,10]. However, challenges remain, including the need for standardized processing

protocol and regulatory approval in many countries. Therefore, this case supports existing evidence that tilapia skin is a viable alternative for burn management, particularly in low-resource setting.

CONCLUSION AND LEARNING POINTS

Conclusion

This case demonstrates that processed Nile tilapia *(Oreochromis niloticus)* skin is an effective low-cost biological dressing for burn management in resources-limited settings. Its application was associated with accelerated wound healing, reduced pain, and improved patient comfort by minimizing procedural trauma and the need for frequent dressing changes. Furthermore, the accessibility and affordability of tilapia skin make it a practical alternative to conventional synthetic and animal -derived dressing, particularly in resource-constrained healthcare settings. This approach may help address gaps in burn care where standard treatments are either unavailable or unaffordable.

Learning Points

- Burn is very common injury occurred by people globally
- Processed Nile tilapia skin is a safe, effective, and low-cost biological dressing for burn wound management
- Tilapia skin xenograft promotes faster wound healing, enhances re-epithelization, and reduces the frequency of dressing changes, and has no side effects
- Its strong adherence to the wound bed minimizes procedural pain and reduces the need for anesthesia, improving patient comfort
- This method provides a practical solution in resource-limited setting where conventional burn care materials are limited or unaffordable
- Locally available biological materials can play a critical role in bridging gaps in burn care delivery in low- and middle-income countries

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AUTHOR DETAILS

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MUHTASARI

Matibabu ya Majeraha Makubwa ya Moto kwa Kutumia Ngozi ya Samaki aina ya Perege kama Kipandikizi (Xenograft) katika Mazingira yenye Rasilimali Chache: Taarifa ya Kisa cha Mgonjwa kutoka Kituo cha Afya cha Mererani, Mkoa wa Manyara, Tanzania

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Utangulizi: Majeraha ya moto yanasalia kuwa ni changamoto kubwa ya kiafya duniani, hasa katika nchi zenye kipato cha chini na cha kati ambapo upatikanaji wa huduma za kisasa za matibabu ya majeraha ya moto ni mdogo. Mbinu bunifu na nafuu za matibabu ni muhimu ili kuboresha matokeo ya matibabu ya wagonjwa katika mazingira yenye rasilimali chache kama Tanzania. Tafiti za hivi karibuni zimeonesha kuwa ngozi ya samaki aina ya Perege (Nile tilapia) kwa kisayansi anitwa *Oreochromis niloticus* inaweza kutumika kama kipandikizi cha kibaolojia chenye uwezo mkubwa, kwa kusaidia kuharakisha uponaji wa majeraha kupitia uundaji wa ngozi mpya (epithelialization). Utafiti huu, ulifanyika katika Kituo cha Afya cha Mererani, Mkoa wa Manyara, ikiwa ni mara ya kwanza kutathmini ufanisi wa kimatibabu na uwezo wa uponyaji wa majeraha kwa kutumia ngozi ya samaki iliyosafishwa na kutibiwa kitalaam kwa wagonjwa wenye majeraha ya moto ya juu juu na ya kina cha kati.

Hali ya Mgonjwa: Tunaripoti kisa cha mgojwa mwanaume mwenye umri wa miaka 26 aliyepata majeraha makubwa ya moto yaliyohusisha takribani asilimia 40 ya jumla ya eneo lote la mwili kufuatia mlipuko wa jiko la gesi. Mchakato wa matibabu yake ulikuwa na changamoto zilizojumuisha kuchelewa kupata huduma, maambukizi ya damu (septicemia), na kifua kikuu cha

mapafu. Hali hii ilichangiwa pia na hali mbaya ya kiuchumi ya mgonjwa na changamoto za upatikanaji wa huduma za afya.

Uchunguzi wa Maabara: Matokeo ya vipimo vya maabara yalionesha upungufu wa damu (hemoglobini 10 g/dL), kiwango cha kawaida cha sukari kwenye damu bila kufunga (4.5 mmol/L), kutokuwepo kwa vimelea vya malaria, na matokeo ya kuwa na maabukizi bakteria wa kifua kikuu kwa kipimo cha GeneXpert.

Matibabu na Matokeo: Mgonjwa alipatiwa dawa za antibiotiki kwa njia ya mishipa ya damu (intravenous) kwa ajili ya septicemia na alianzishiwa tiba ya kifua kikuu kufuta taratibu za matibabu. Kutokana na changamoto za kifedha, ngozi ya samaki aina ya Perege (Nile tilapia) iliyosafishwa na kutibiwa kitalaam ilitumika kama kipandikizi cha kibaolojia kufunika jeraha. Matumizi haya yalionesha kushikamana vizuri na sehemu ya jeraha, kupunguza ubadilishaji wa mara kwa mara kama bandeji za zingetumika, kupunguza maumivu, na kuchochea uundaji wa ngozi mpya. Mgonjwa alionesha kuimarika kwa hali ya afya na aliruhusiwa kurudi nyumbani baada ya siku 14 akiwa katika hali thabiti, na hapakuwa na madhara yoyote yaliyoripotiwa.

Hitimisho: Kisa hiki kinaonesha kuwa ngozi ya samaki aina ya Perege iliyosafishwa na kutibiwa kitalaam ni tiba ya kibaolojia yenye ufanisi na gharama nafuu kwa matibabu ya majeraha ya moto katika mazingira yenye rasilimali chache. Matumizi yake yalihusishwa na uponaji wa jeraha kwa kasi, kupunguza maumivu, na kuboresha faraja ya mgonjwa kwa kupunguza madhara ya mara kwa mara za kubadilisha bandeji. Aidha, upatikanaji wake kwa urahisi na gharama nafuu hufanya iwe mbadala mzuri wa matibabu ya kisasa ikilinganishwa na matumizi ya ngozi ziliyotengenezwa viwandani au vinavyotokana na wanyama. Mbinu hii inaweza kusaidia kuziba pengo katika huduma za matibabu ya majeraha ya moto pale ambapo matibabu ya kwa kutumia matibabu ya kawaida hayapatikani au gharama zake ni kubwa.

Maneno Muhimu: Majeraha ya Moto, Ngozi ya Samaki, Kipandikizi, Marerani, Tanzania

REFERENCES

1. World Health Organization. Burns [Internet]. Geneva: WHO; 2018 [cited 2026 Apr 8]. Available from:https://www.who.int/news-room/fact-sheets/detail/burns
2. Wasiak J, Cleland H, Campbell F. Dressings for superficial and partial thickness burns. Cochrane Database Syst Rev. 2013:CD002106.
3. Atiyeh BS, Costagliola M, Hayek SN. Burn wound cleansing and debridement: the role of anesthesia. Ann Burns Fire Disasters. 2005;18:70–3.
4. Alves APNN, Verde MEQL, Ferreira Júnior AEC, et al. Nile tilapia skin as a biological dressing for burn wounds: a randomized clinical trial. Burns. 2020;46:1–9.
5. Miranda MJB, Brandt CT, et al. Use of tilapia skin as a xenograft for burn treatment in Brazil. Rev Bras Cir Plást. 2017;32:1–8.
6. Costa BA, Lima Júnior EM, Moraes Filho MO, et al. Use of tilapia skin in burn treatment: a systematic review. J Burn Care Res. 2019;40:714–23.
7. Lund CC, Browder NC. The estimation of areas of burns. *Surg Gynecol Obstet.* 1944;79:352–8.
8. Lima Júnior EM, Moraes Filho MO, Rocha MBS, et al. Innovative treatment using tilapia skin as a xenograft for partial thickness burns: a case series. *J Burn Care Res.*2017;38:e698–705.
9. Costa BA, Lima Júnior EM, Moraes Filho MO, et al. Use of tilapia skin in burn treatment: a systematic review.*J Burn Care Res.* 2019;40:714–23.
10. Alves APNN, Verde MEQL, Ferreira Júnior AEC, et al. Nile tilapia skin as a biological dressing for burn wounds: a systematic review.*Burns.*2020;46:1–10.

Intestinal Obstruction Complicating Acute Cholera: A Case Report from Southern Tanzania

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ABSTRACT

Introduction: Cholera remains a major public health problem in sub-Saharan Africa and is typically characterized by acute watery diarrhea leading to severe dehydration and electrolyte imbalance. Mechanical intestinal obstruction complicating acute cholera is extremely rare and may be overlooked, resulting in significant morbidity and mortality.

Case Presentation: We report the case of a 47-year-old male from southern Tanzania who presented with profuse rice-water diarrhea, abdominal cramps, and generalized weakness. On examination, he was hypotensive with clinical features of moderate dehydration. Rapid stool testing was positive for *Vibrio cholerae*. During admission, despite appropriate fluid resuscitation and antibiotics therapy, he developed progressive abdominal distension, vomiting, with clinical features suggestive of intestinal obstruction, while the diarrhea persisted.

Laboratory Investigations: Laboratory investigations revealed severe acute kidney injury. Stool culture and antimicrobial susceptibility testing performed at the national reference laboratory confirmed *Vibrio cholerae*. Plain abdominal radiographs demonstrated features of both large and small bowel obstruction, consistent with sigmoid volvulus.

Treatment and Outcome: An emergency laparotomy revealed a gangrenous twisted sigmoid colon and a segment of gangrenous small bowel. Surgical resection with primary anastomosis was performed. The patient had an uneventful postoperative course and recovered well, and was discharged without complications after 18 days of hospitalization. The patient remained well on follow-up.

Conclusion: This case underscores the importance of considering rare surgical complications in patients with acute cholera who present with atypical or worsening abdominal symptoms. Early recognition and prompt surgical intervention is essential to reduce adverse outcomes.

Keywords: Sigmoid Volvulus, Cholera, Songea, Tanzania

INTRODUCTION

Cholera remains a major public health problem in sub-Saharan Africa and is characterized by acute watery diarrhea that can rapidly lead to severe dehydration, electrolyte imbalance, and renal failure if not promptly treated [1]. Early and Aquent fluid replacement, together with appropriate antibiotics therapy, is usually effective in reducing morbidity and mortality [2]. However, atypical complications or coexisting surgical conditions may occur and can be easily be overlooked during acute management. Mechanical intestinal obstruction occurring during acute cholera is extremely rare, and awareness of this possibility is essential to prevent delayed diagnosis, increased morbidity, and potential mortality [3].

We report a peculiar case of cholera complicated by unusual clinical presentation managed at a health facility in Songea Region. Written informed consent was obtained from the patient for publication of this case report.

CASE PRESENTATION

Patient information: A 47-year-old male peasant from Bombambili Sokoine area, Songea Municipal, Tanzania, presented on November 10, 2025 with a one-day history of profuse watery diarrhea described as rice water stools, associated with abdominal cramps and generalized weakness. The symptoms began on November 9, 2025. He had no known history of chronic medical illness.

On admission, the patient was alert but clinically dehydrated. His vital signs were as follows: blood pressure 90/50 mmHg, heart rate 99 beats per minute, respiratory rate 22 cycles per minute, temperature 37°C, and oxygen saturation 98% on room air. Physical examination revealed dry mucous membranes and reduced skin turgor, findings consistent with moderate dehydration.

Laboratory Investigations

A stool rapid diagnostic test was positive for cholera. Stool culture and antimicrobial sensitivity testing were sent to the national laboratory and subsequently confirmed *Vibrio cholerae*. Serum electrolytes analysis showed sodium of 136 mmol/L and potassium of 4.8 mmol/L. Serum creatinine was markedly elevated at 535.6 µmol/L, consistent with severe acute kidney injury.

During hospital admission, the patient developed progressive abdominal distension associated with nausea and vomiting, while diarrhea persisted but gradually lost its classical rice-water appearance. Abdominal examination demonstrated asymmetrical distension, hyper-tympanic percussion, increased bowel sounds,

and bilateral pitting pedal oedema. Plain erect and supine abdominal radiographs demonstrated markedly dilated small bowel loops and radiological features suggestive of large bowel obstruction, consistent with sigmoid volvulus [4].

Differential Diagnosis

The following deferential diagnosis were considered:

- Paralytic ileus secondary to dehydration and electrolyte imbalance
- Mechanical intestinal obstruction, particularly sigmoid volvulus
- Toxic megacolon
- Acute mesenteric ischemia

Treatment

Initial management followed standard cholera treatment guidelines and included aggressive intravenous fluid resuscitation with crystalloids, administration of oral rehydration solution, and appropriate antibiotic therapy [1,2]

Following radiological confirmation of intestinal obstruction, the patient underwent an emergency exploratory laparotomy. Intraoperative findings revealed a gangrenous twisted sigmoid colon consistent with sigmoid volvulus, as well as a twisted segment of small bowel with focal areas of gangrene. Surgical management involved resection of the gangrenous sigmoid colon with primary end-to-end anastomosis, in addition to wedge resection of the affected small bowel. The procedure was completed without intraoperative complications.

Outcome and Follow-up

The postoperatively course was eventful. The patient demonstrated satisfactory clinical recovery, with return of bowel function and tolerance of oral feeding within 48 hours after surgery. There were no postoperative complications that were observed. He remained hospitalized for 18 days for continued monitoring and supportive care and was subsequently discharged in stable condition.

Follow-up was conducted via telephone revealed no complaints. The patient was scheduled for outpatient review and suture removal one week after discharge.

DISCUSSION

Sigmoid volvulus is a well-recognized cause of large bowel obstruction in many parts of sub-Saharan Africa and other low- and middle -income countries, account for a substantial proportion of surgical emergencies involving the colon [4,5]. Delayed diagnosis is associated with significant morbidity due the risk of bowel ischemia, perforation, sepsis, and electrolyte derangements. Predisposing factors include a redundant sigmoid colon, chronic constipation, high-fiber diets, and conditions that alter intestinal motility [6].

Acute diarrheal illnesses including cholera, may contribute to development of volvulus through profound dehydration, electrolyte imbalance, and disturbed gastrointestinal motility. Severe hypovolemia and metabolic derangements can impair mesenteric perfusion and intestinal function, potentially facilitating torsion in anatomically susceptible individuals. In addition, massive bowel fluid losses may lead to relative bowel collapse and abnormal peristalsis, further increasing the risk of volvulus.

In patients with cholera, gastrointestinal manifestation such as abdominal distension and vomiting, and reduced bowel sounds may be misattributed to severe gastroenteritis or paralytic ileus, resulting in delayed recognition of underlying mechanical obstruction. This diagnosis challenges are particularly relevant in resources-limited settings, where access to advanced imaging may be restricted and clinical overlap between infections and surgical abdominal conditions are common. Persistent abdominal distension, progressive vomiting, abdominal tenderness, or failure to improve despite adequate fluid resuscitation should prompt reconsideration of the diagnosis and evaluation for surgical pathology.

This case highlights the importance of maintaining a high index of suspicion for intestinal obstruction in cholera patients who develop atypical or worsening abdominal symptoms despite adequate rehydration. Early use of plain abdominal radiography, which is often readily available, can aid in prompt diagnosis. Timely surgical intervention remains crucial to prevent bowel ischemia, gangrene, and death, particularly when signs of strangulation or perforation are present [7]. Awareness of this rare but serious complication may facilitate earlier diagnosis and improve outcomes in cholera-endemic regions.

CONCLUSION AND LEARNING POINTS

Conclusion

This case highlights a rare but life-threatening complication of acute cholera, mechanical intestinal obstruction with bowel gangrene. While cholera is primary managed medically, clinicians must remain vigilant for atypical presentations and coexisting surgical conditions. Early recognition and prompt surgical intervention is essential to reduce adverse outcomes.

Learning Points

- Cholera may rarely be complicated by mechanical intestinal obstruction, including sigmoid volvulus, which constitutes a surgical abdominal emergency.
- Persistent abdominal distension, vomiting, or altered stool characteristics in patient with cholera should prompt urgent evaluation for an underlying surgical cause.
- Timely plain abdominal radiography and other appropriate management are critical for favorable clinical outcomes.
- Maintaining a high index of suspicion can prevent diagnostic delay and improve survival, particularly in resource limited settings.

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MUHTASARI

Tatizo la Kuziba kwa Utumbo Kunakotokea pamoja na Kipindupindu: Ripoti ya Kisa kutoka Kusini mwa Tanzania

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Utangulizi: Kipindupindu ni ugonjwa unaoendelea kuwa tatizo kubwa la afya ya jamii kusini mwa jangwa la Sahara. Kwa kawaida husababisha kuharisha maji maji sana yanayofanana na maji ya mchele hali inayosababisha upungufu mkubwa wa maji mwilini. Ni nadra sana kwa mgonjwa wa kipindupindu kupata tatizo la kuziba kwa utumbo, na hali hii inaweza isionekane mapema na kusababisha madhara makubwa au hata vifo.

Uwasilishaji wa Kisa: Tunawasilisha kisa cha mwanaume mwenye umri wa miaka 47 kutoka kusini mwa Tanzania aliyekuwa na dalili za kuharisha maji maji mengi yanayofana na maji ya mchele, maumivu ya tumbo, na udhaifu wa mwili. Katika uchunguzi, alikuwa na shinikizo la damu la chini pamoja na upungufu wa maji mwilini. Kipimo cha haraka cha kinyesi kilionyesha kuwa na vimelea vinavyosababisha ugonjwa wa kipindupindu (Vibrio cholerae). Akiwa amelazwa, licha ya kupewa maji kwa njia ya mishipa na tiba ya antibiotiki ipasavyo, alianza kuonesha dalili za kuvimba tumbo, kutapika, pamoja na dalili zinazoashiria kuziba kwa utumbo, huku kuharisha kukiendelea.

Uchunguzi wa Kimaabara: Vipimo vya maabara vilionesha figo zake zilikuwa hazifanyi kazi vizuri kwa ghafla. Uchunguzi wa kinyesi na upimaji wa uwezo wa dawa kwa kutibu vimelea ulifanyika katika maabara ya taifa ulithibitisha uwepo wa vimelea vya kipindupindu (Vibrio cholerae). Picha za eksirei za tumbo zilionyesha kuziba kwa utumbo mkubwa na mdogo, hali inayoashiria kujifunga kwa utumbo (sigmoid volvulus).

Matibabu na Matokeo: Upasuaji wa dharura wa kufungua tumbo (laparotomy) ulionesha uwepo wa sehemu ya utumbo mkubwa iliyojikunja na kuoza, pamoja na sehemu ya utumbo mdogo iliyokuwa imeoza. Uondoaji wa sehemu zilizoathirika na kuunganisha tena utumbo moja kwa moja (end to end anastomosis) ulifanyika. Mgonjwa alipona vizuri bila matatizo baada ya upasuaji na aliruhusiwa kurudi nyumbani baada ya siku 18 za kulazwa hospitalini. Aliendelea kuwa na hali nzuri katika ufuatiliaji.

Hitimisho: Kisa hiki kinaonesha umuhimu wa kuzingatia uwezekano wa matatizo ya nadra ya upasuaji kwa wagonjwa wenye kipindupindu wanaopata dalili za tumbo zisizo za kawaida au zinazozidi kuwa hatarishi za tumbo. Utambuzi wa mapema na kufanya upasuaji kwa wakati ni muhimu kuweza kuokoa maisha.

Maneno Muhimu: Kijifunga kwa Utumbo, Kipindupindu, Songea, Tanzania

REFERENCES

1. World Health Organization. Cholera Annual Report 2023. Weekly Epidemiological Record, 9 September 2024, Vol 99 (36), (pp 481- 496)https://cdn.who.int/media/docs/default-source/dco/wer_36_2024_cholera-annual-report-for-2023_bilingual-proof.pdf?sfvrsn=86fb1faf_1
2. Harris JB, LaRocque RC, Qadri F, Ryan ET, Calderwood SB. Cholera. Lancet. 2012 Jun 30;379(9835):2466-2476. doi: 10.1016/S0140-6736(12)60436-X. PMID: 22748592; PMCID: PMC3761070.
3. Sack DA, Sack RB, Nair GB, Siddique AK. Cholera. Lancet. 2004 Jan 17;363(9404):223-33. doi: 10.1016/s0140-6736(03)15328-7. PMID: 14738797.
4. De U. Sigmoid volvulus in rural Africa. *Trop Doct* 2002;32:164–6.
5. De U. Sigmoid volvulus in rural Bengal. Trop Doct. 2002 Apr;32(2):80-2. doi: 10.1177/004947550203200207. PMID: 11931206.
6. Korkut E, Peksoz R, Disci E, Atamanalp SS. Factors affecting recurrence in sigmoid volvulus. Pak J Med Sci. 2023;39(1):150-153. doi: 10.12669/pjms.39.1.6882. PMID: 36694777; PMCID: PMC9842996.
7. Ballantyne GH. Review of sigmoid volvulus: history and results of treatment. Dis Colon Rectum. 1982;25(5):494-501. doi: 10.1007/BF02553666. PMID: 7047106.
8. World Health Organization. Guidelines for the control of cholera outbreaks. Geneva: WHO; 2019

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