Hand Hygiene Self-Assessment across Health Facilities in Dodoma Region in Tanzania: A baseline assessment report using WHO Multimodal Hand Hygiene Improvement Strategy

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ABBREVIATIONS AND ACRONYMS

DC…….District council

EF…….Evaluation and feedback

HCAI…….Health-care associated infections

HPSS…….Health Promotion and System Strengthening

IPC…….Infection prevention and control

IQR……. Interquartile range

RW…….Reminders in the work place

SC…….System change

TE……Training and education

WHO……World Health Organization

OPERATIONAL DEFINITIONS

Health facility: a place which is formally registered by the government of the United Republic of Tanzania to provide health care services to people. In this regards, health facilities include hospitals, health centres and dispensaries.

Health facility unit: a specific section or subsection within a health facility. Health facility units involved in this assessment were labor ward, surgical ward, outpatient, theatre, pharmacy and laboratory.

Hand hygiene: a general term referring to any action of hand cleansing by water and detergent/soap or alcohol hand-rub; as well as all individual, institutional or environmental factors influencing execution of hand cleansing practices.

Hand hygiene level: a quantitative interpretation obtained by adding individual-scores of the four components of *WHO Hand Hygiene Self-Assessment Framework Tool (2010)*. Each component has a total of 100 score, giving an overall maximum hand hygiene score of 500. In this regard, interpretation of hand hygiene levels were inadequate (0 -125), basic (126 – 250), intermediate (251 – 375) or advanced (376 -500).

EXECUTIVE SUMMARY

Background

Health-care associated infections (HCAI) are associated with significant morbidity, mortality and extra costs both in developed and developing countries. Compliance to the guidelines on hand hygiene is pivotal in prevention and control of HCAI. Despite existing evidence on HCAI like neonatal septicaemia and surgical site infections in various hospitals Tanzania, there is limited information on the specific assessment of hand hygiene in various health facilities using standardized World Health Organization (WHO) tools. Therefore, this project was aimed at assessing hand hygiene level in various health facilities in Dodoma region so as to guide specific future IPC interventional measures.

Methodology

Baseline hand hygiene assessment was conducted in March 2018, involving 7 hospitals, 27 health centres and 165 dispensaries in Dodoma regions. A total of 261 in-charges/head of units or health worker responsible in a particular unit (labor ward, outpatient, theatre, pharmacy, surgical ward and laboratory) participated. Data were collected using interviews and observation using *WHO Hand Hygiene Self-Assessment Framework Tool (2010)* which has five components [system change (SC), training and education (TE), evaluation and feedback (EF), reminders in the work place (RW), and institutional safety climate (ISC)]. Each of these indicators has a subtotal of 100 score, giving an overall maximum hand hygiene score of 500. Final cumulative scores stratified each of the health facility's unit into inadequate (0 -125), basic (126 – 250), intermediate (251 – 375) or advanced (376 -500) hand hygiene level. Analysis was done using STATA version 13.0 software according to the objectives of the assessment.

Results

Of the 261 health facility units assessed, approximately three quarter were labor wards, 195 (74.7%), followed by outpatient units 34 (13.0%). The overall hand hygiene level in Dodoma region was inadequate, with the median hand hygiene score (IQR) of 80 (60 – 145). The median hand hygiene score (IQR) was significantly higher in hospitals [107 (80 – 182.5)], compared to health centres [76.3 (60 – 125)] and dispensary [75 (55 – 145)]; *chi2= 7.765; p-value = 0.021.* None of the health facilities had advanced hand hygiene level. Three district councils had relatively high hand hygiene scores (at basic hand hygiene level) and these were Kondoa Town Council [205 (180 – 230)], Chemba District Council [155 (105 – 212.5)] and Kondoa District Council [151.3 (113.8 – 205)].

Evaluation of hand hygiene indicators in health facility units revealed that, SC had the highest median score (IQR) of 40 (30 – 50), followed by EF [15 (15 – 30)]; on the other hand TE, RW and ISC had the lowest median score (IQR) of 5 (0-15), 5 (0 – 25) and 5 (0 – 35), respectively. RW had significantly higher score in hospitals [22.5 (5 – 31.5)] compared to health centres [5 (0 – 17.5)] and dispensaries [5 (0 -22.5)]; *chi2= 10.275; p-value= 0.006.* The continuous supply of water and alcohol-based hand rub were observed in 82.8% (216/261) and 23.4% (61/261) of units, respectively *(p-value <0.001)*. Half of units were observed to have posters explaining the correct hand-washing techniques. Approximately 82.7% (216/261) workers reported no formal training regarding hand hygiene using WHO tool (or similar tools). Of the 56 (21.5%) of health workers who responded to have participated in hand hygiene compliance monitoring using the WHO Hand Hygiene Observation tool (or similar technique), only two health workers reported to have compliance rate above 81%. Over three quarters of respondents had neither received immediate feedback nor

systematic feedback, and only 5.4% of units reported to have a dedicated team established with regard to the promotion and implementation of optimal hand hygiene practice.

Conclusion

The overall hand hygiene level in Dodoma region was inadequate, with relatively high hand hygiene score in hospitals compared to health centres and dispensaries. The SC and EF had relatively higher scores compared to TE, RW and ISC indicators. Majority of health facilities had a continuous supply of water; with very few observed to have alcohol-based hand rub. Self-reported hand hygiene compliance rate and presence of dedicated teams established with regard to the promotion and implementation of optimal hand hygiene practices remained extremely low in majority of health facilities.

Project significance and recommendations

This baseline assessment has generated baseline information on hand hygiene level across various health facilities in Dodoma region, which in turn will guide specific hand hygiene and IPC interventional measures. In this regard; individual, institutional and governmental policy key gaps have been identified (mostly in TE, RW and ISC indicators; and in lower health facilities) to allow future specific interventional measures.

Generated baseline information will be pivotal in future hand hygiene re-assessments to delineate the change in trends regarding hand hygiene levels in the context of IPC.

Keywords

WHO hand hygiene assessment tool, Health facilities, Dodoma, Tanzania

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: BACKGROUND

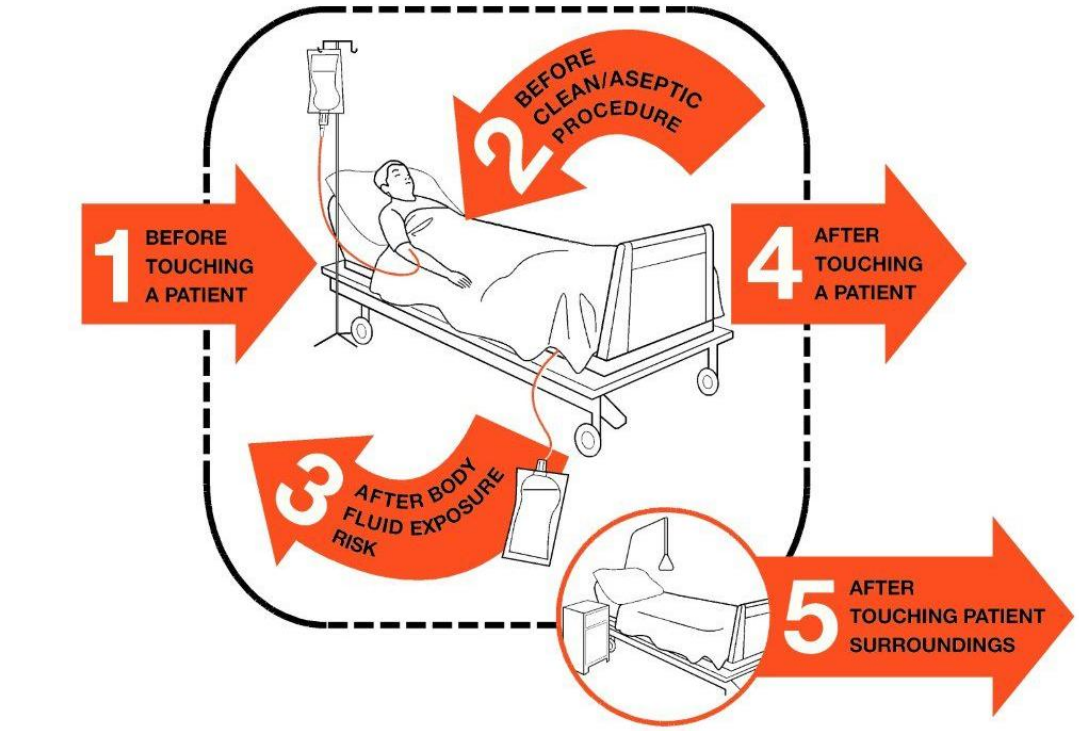
1.1 Introduction

Healthcare-associated infections (HCAIs) is the most challenging situation affecting both developed and developing countries (Nejad et al., 2011). The burden of HCAIs is further complicated by preponderance of multi-drug resistant (MDR) pathogens in the hospitals as opposed to the community-settings, resulting into significance morbidity, mortality and extra health-care expenditure (Peleg and Hooper, 2010, WHO, 2014, Seni et al., 2017). In Tanzania for example, MDR attributable infections are predominant among patients admitted in the hospitals as opposed to those with community associated infections, moreover surgical patients and under-five children and specifically neonates with sepsis remain the most vulnerable groups to these infections (Mshana et al., 2009, Blomberg et al., 2007, Kayange et al., 2010, Sonda et al., 2016). Of note, approximately 20 – 25% of children acquiring MDR- HCAIs die in tertiary hospitals in Tanzania (Blomberg et al., 2007, Kayange et al., 2010).

Previous reports from Mwanza and Dar es salaam showed similar clones of MDR pathogens, notably Methicillin resistant *Staphylococcus aureus* (MRSA)-ST88 and ST1797 causing surgical site infections, and bla$_{CTX\text{-}M\text{-}15}$ allele for extended spectrum beta lactamase (ESBL)-producing Gram negative bacteria sepsis and diarrhoea (Moremi et al., 2012, Mshana et al., 2013, Tellevik et al., 2016). The clonal nature of spread of these pathogens among patients with surgical site infections and sepsis suggested possibility of potential common sources (Moremi et al., 2012, Mshana et al., 2013), but delineation of the ultimate sources remained to be explored. Various reports on infection prevention and control (IPC) in

Tanzania have stipulated on the specific guidelines, standard procedures and communication strategies to ensures IPC and ultimate patient safety (JHPIEGO., 2012, URT, 2012, URT, 2016). Nevertheless, there are still a number of challenges on accomplishing this target ranging from scarcity of material resources, lack of technical know-how in some medical personnel, and administrative logistical constraints (JHPIEGO., 2012, URT, 2012, Jones et al., 2015, URT, 2016).

Although it is not clear yet whether hands are passive vehicles or reservoirs of transmission of HCAIs, healthcare workers' hands endogenously carrying MDR pathogens or contaminated from patients as well as environmental interfaces have been shown to play a critical role in transmitting HCAIs (Larson, 1981, Pittet et al., 2006, Weber et al., 2010). Despite the fact that adherence to hand hygiene practices has been shown to be pivotal in reducing carriage of MDR pathogens among healthcare workers' hands and subsequently transmission to patients, compliance to this has surprisingly remained around 40% only (Allegranzi and Pittet, 2009, WHO, 2009a). In the light of these, WHO introduced specific documents to address hand hygiene which include (but not limited to) '*Hand Hygiene Technical Reference Manual'*, *'WHO Guidelines on Hand Hygiene in Health-care: A Summary', 'WHO Hand Hygiene Technical Reference Manual'*, and *The WHO 'Glove Use Information' Leaflet*. Moreover, the *"5 Moments of Hand Hygiene"* is a pivotal tool in encouraging health-care workers to clean their hands before touching patient, before clean/aseptic procedures, after body fluid exposure/risk, after touching a patient, and after touching patient surroundings (WHO, 2009b) (Figures 1, 2, & 3).



1	BEFORE TOUCHING A PATIENT	WHEN?	Clean your hands before touching a patient when approaching him/her.
		WHY?	To protect the patient against harmful germs carried on your hands.
2	BEFORE CLEAN/ ASEPTIC PROCEDURE	WHEN?	Clean your hands immediately before performing a clean/aseptic procedure.
		WHY?	To protect the patient against harmful germs, including the patient's own, from entering his/her body.
3	AFTER BODY FLUID EXPOSURE RISK	WHEN?	Clean your hands immediately after an exposure risk to body fluids (and after glove removal).
		WHY?	To protect yourself and the health-care environment from harmful patient germs.
4	AFTER TOUCHING A PATIENT	WHEN?	Clean your hands after touching a patient and her/his immediate surroundings, when leaving the patient's side.
		WHY?	To protect yourself and the health-care environment from harmful patient germs.
5	AFTER TOUCHING PATIENT SURROUNDINGS	WHEN?	Clean your hands after touching any object or furniture in the patient's immediate surroundings, when leaving – even if the patient has not been touched.
		WHY?	To protect yourself and the health-care environment from harmful patient germs.

World Health Organization | Patient Safety — A World Alliance for Safer Health Care | SAVE LIVES Clean Your Hands

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

May 2009

Figure 1: Your 5 Moments for Hand Hygiene

(http://www.who.int/gpsc/5may/Your_5_Moments_For_Hand_Hygiene_Poster.pdf?ua=1)

Figure 2: How to hand-wash (*http://www.who.int/gpsc/5may/How_To_HandWash_Poster).*

Figure 3: How to hand-rub *(http://www.who.int/gpsc/5may/How_To_HandRub_Poster.pdf)*

To ensure uniformity and objective assessment of hand hygiene practices, *WHO Hand Hygiene Self-Assessment Framework Tool (2010)* was introduced to promote hand hygiene and ultimately patient safety through IPC measures (WHO, 2009b, WHO, 2009a). This is a guiding tool among health-care professionals for self-assessment of hand hygiene measures and other associated factors in their health facilities. The tool is broadly divided into five components, with 27 indicators. The strategy components are system change, training/education, evaluation and feedback, reminders in the workplace and institutional safety climate (WHO, 2009a). Multimodal strategy have been designed to take into account individuals as well as system related factors in ascertaining the health-care workers compliance to the IPC measures when providing routine care to the patients in the health facilities irrespective of the level of health facilities or economic status (WHO, 2009a).

1.2 Problem statement and Rationale

Multi-drug resistance pathogens' attributable HCAIs result into significant morbidity, mortality and costs (Blomberg et al., 2005, Kayange et al., 2010). Recent reports from Mwanza and Dodoma showed that the proportions of women developing surgical site infections post-caesarean section were 11% and 48% respectively, calling for an urgent need to delineate the primary sources of these infections and ultimately provide specific preventive measures (Mpogoro et al., 2014, De Nardo et al., 2016).

HCAIs can largely be reduced if stringent hand hygiene measures are adherence among health-care workers (Allegranzi and Pittet, 2009). Strikingly, compliance to hand hygiene measures among health-care workers has remained unacceptably low (< 40%) in most areas as opposed to an ideal compliance rate of more than 80%, a situation which threatens

continuous transmission of MDR pathogens among vulnerable patients in the health facilities (WHO, 2009a). In Tanzania, evidence of reduction of bacterial load from hands washed with alcohol-based sanitizer and soap has been documented (Pickering et al., 2010), but there is limited information specifically on the assessment of hand hygiene among health-care workers in various health facilities using standardized WHO tools. This in turn limits various stakeholders to harmoniously identify specific individuals, institutional and policy-related gaps for interventions in the context of IPC measures.

1.3 Objectives

1.3.1 Broad objective

To assess hand hygiene level in various health facilities in Dodoma region using WHO hand hygiene self-assessment tool in the context of IPC.

1.3.2 Specific objectives

1. To determine the baseline hand hygiene level in hospitals, health centres and dispensaries in Dodoma region using WHO hand hygiene self-assessment tool.
2. To compare the hand hygiene level across health facilities constituting similar rank in the Tanzanian health facilities' hierarchy.
3. To provide evidence-based interventional measures relevant to health facilities using WHO improvement tools.

CHAPTER TWO: METHODOLOGY

2.1 Assessment design and settings

This baseline assessment was conducted in Dodoma region in March 2018. Dodoma region is located in the central zone and is the capital city of the United Republic of Tanzania. It has a population of 2,083,588 as per National Census, 2012. Dodoma region has a total of 8 hospitals, 30 health centres and 284 dispensaries. The region has 8 district councils. The current assessment divided these eight district councils into three teams/clusters namely, Dodoma urban, Chamwino and Bahi **(Team/cluster 1)**; Kondoa town council, Kondoa district council and Chemba **(Team/cluster 2)**, Kongwa and Mpwapwa **(Team/cluster 3) (Appendix i)**.

2.2 Sampling population and sample size

This assessment involved in-charge/head of unit or any other health worker responsible in a health facility's unit in Dodoma region. Sample size estimation was calculated using Yamane Taro formula (Yamane, 1967), using the total number of health facilities in Dodoma region.

$n = N/1+N\,(e)^2$

n=sample size

N=population size (30 for health centres and 284 for dispensaries)

e=level of precision (5%)

Dispensaries, $n=284/1+284\ (0.05)^2$ = **166**; Health centres, $n=30/1+30(0.05)^2$ = **28**; and **8** hospitals were planned to be involved in the assessment.

Selection of dispensaries and health centres was done by taking all divisions in each district council; and then in each division, a random sampling was done to get the required sample size. All hospitals were conveniently involved in this baseline assessment (Appendix i). Six units in hospitals namely labour ward, theatre, outpatient, laboratory, pharmacy and surgical ward were involved; three units in health centres namely labour ward, theatre, and outpatient were involved; and finally, labour ward from each dispensary was also involved. Therefore, a total of 261 in-charge/head of units/health workers who voluntarily gave consent to participate were involved in this baseline assessment from 7 hospitals, 27 health centres and 165 dispensaries (Appendix i & ii).

2.3 Data management

2.3.1 Sources of data

Data was collected using interviews and observations from in-charge/head of unit or any other health worker responsible in a health facility's unit using the *WHO Hand Hygiene Self-Assessment Framework 2010 Tool*. This tool is divided into five components containing 27 indicators (WHO, 2009b) (appendix iii).

2.3.2 Preparation for data collection

The project assessment team (lead by the consultant) had a 5-day training session on the general principles of hand hygiene in the context of IPC, assessment protocol and pre-testing of data collection tool in three health facilities. Selected health facilities for pilot were different from health facilities involved in the assessment. This was followed by a feed-back session, where raised questions/inquiries/concerns be addressed to ensure that all research assistants were conversant with the data collection tool.

2.3.3. Hand hygiene assessment data collection

The assessment was done by research assistants under direct supervision of the team leads, data quality officer and project consultant. Data were collected using interviews and observation using *WHO Hand Hygiene Self-Assessment Framework Tool (2010)* which has five components [system change (SC), Training and Education (ET), evaluation and feedback (EF), reminders in the work place (RW), and institutional safety climate (ISC)] (WHO, 2009b).

Figure 4: Data collection activities by research assistants in Dodoma region

***Left**: Dr. Shabani Hamada and Mrs. Veronica Alex; **Right**: Dr. Shabani Hamada, Mrs. Veronica Alex and two staff after an interview in one of the health facility. Photo credit to Dr Shabani Hamada*

2.3.4 Data analysis

Data collected were entered into Excel sheet for cleaning and consistency checks; and then exported to STATA version 13.0 software for analysis according to the objectives of the study. Each of the five indicators had a subtotal of 100 score, giving an overall maximum hand hygiene score of 500. Final cumulative scores stratified each of the health facility's unit into inadequate (0 -125), basic (126 – 250), intermediate (251 – 375) or advanced (376 -500) hand hygiene level. Categorical variables were described as proportions (percentages) and compared using Chi-squared test. Continuous variables like hygiene scores in various components and indicators were described as mean ± standard deviation or median scores (interquartile range) depending on the distribution of data. Nonparametric methods (where appropriate) were used to compare hand hygiene median scores in various variables such as district councils, health facility ranks and health facility units. A p-value of <0.05 was used as a cut-off value to assess statistical significant differences in hand hygiene level and various variables.

2.4 Ethical considerations and assessment permission

This base line was approved by The Joint CUHAS/BMC Research and Ethics Committee *(CREC 272/2018)*. Permission was also sought and given by relevant government authorities like the regional administrative secretary, district administrative secretaries, district executive directors and in-charges of the respective health facilities. A voluntary written informed consent was sought and given by every participant prior to be involved in the assessment (appendix ii).

2.5 Conflict of interest declaration

The investigators declare that they have no competing interests.

CHAPTER THREE: RESULTS

3.1 Baseline demographics of interviewees across various health facilities

A total of 261 health workers were interviewed in March 2018. The mean age ± standard deviation of the interviewees was 35 ± 10.3 years (minimum and maximum ages being 23 and 59 years, respectively). Majority of interviewees were females (72.7%) and nurses (59.0%) (Figure 5).

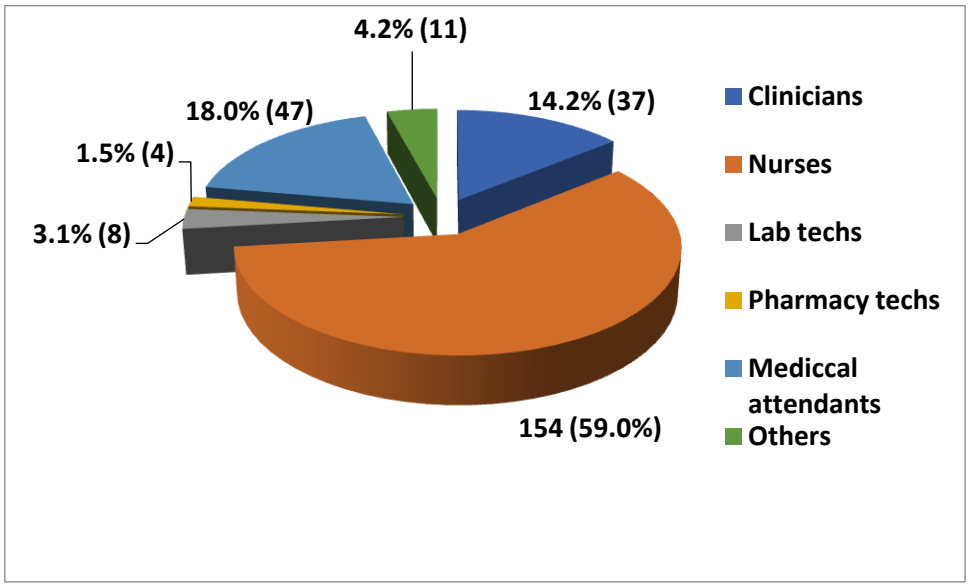


Figure 5: Distribution of interviewees' profession (N= 210)

3.2 Description of heath facilities and units assessed in Dodoma region

A total of seven hospitals, 27 health centres and 165 dispensaries were assessed from eight district councils. The units assessed across various district councils were 51 (19.5%) from Dodoma municipal council, Kongwa district council 38 (14.6%), Mpwapwa district council 36 (13.8%), Chamwino district council 34 (13.0%), Bahi district council 32 (12.3%), Kondoa district council 32 (12.3%), Chemba district council 31 (11.9%) and Kondoa Town Council 9

(2.7%). Of the 261 health facility units assessed, approximately three quarter were labor wards 195 (74.7%), followed by outpatient units 34 (13.0%) (Table 1).

Table 1: Distribution of various units assessed across health facilities in Dodoma region

Health facility unit	Number (n)	Percentage (%)
Labor ward	195	74.7
Outpatient	34	13.0
Theatre	13	5.0
Pharmacy	7	2.7
Surgical ward	6	2.3
Laboratory	6	2.3
Total	261	100.0

3.3 Hand hygiene levels in 261 health facility units in Dodoma region

3.3.1 Hand hygiene scores in 261 health facility units

The overall hand hygiene level in 261 units in Dodoma region was inadequate, with the median hand hygiene score (IQR) of 80 (60 – 145). The minimum and maximum scores were 0 and 322.5, respectively. Of the 261 units assessed, only six (2.3%) had intermediate (consolidated) hand hygiene level and none of the units had advanced (embedding) hand hygiene level (Figure 6).

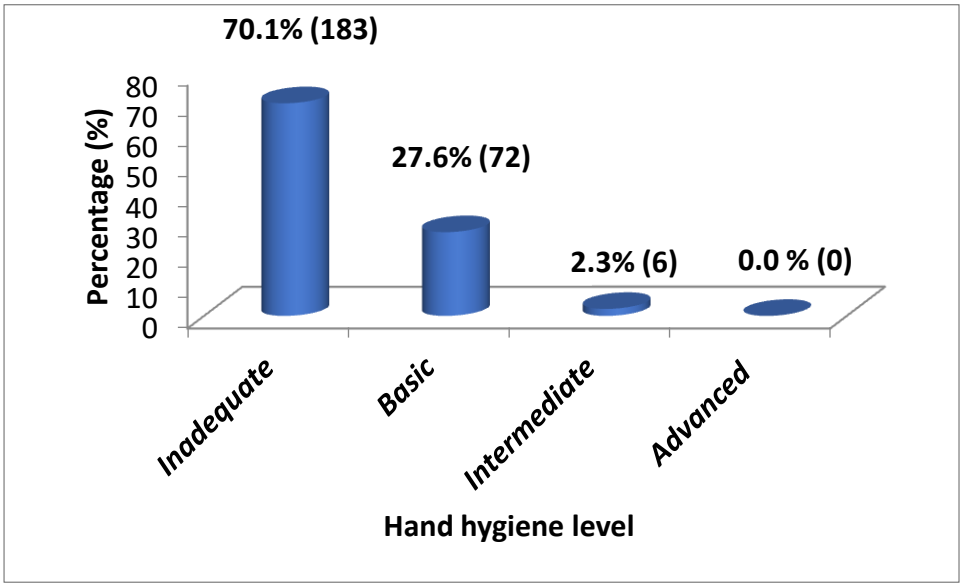


Figure 6: Hand hygiene level in health facility units in Dodoma region

3.3.2 Hand hygiene scores by ranks of health facilities in Dodoma region

The median hand hygiene score (IQR) was significantly higher in hospitals [107 (80 – 182.5)], compared to health centres [76.3 (60 – 125)] and dispensary [75 (55 – 145)]; *chi2= 7.765; p-value = 0.021*. Similarly, hospitals had higher median score compared to health centres and dispensaries (when health centres and dispensaries were grouped together as one cluster); 107.5 (80 – 182.7) versus 75 (55 – 137.3), *p-value = 0.001.*

3.3.3 Hand hygiene scores and levels by district councils in Dodoma region

Irrespective of the rank of health facilities, three district councils had relatively high hand hygiene scores (at basic hand hygiene level) and these were Kondoa TC [205 (180 – 230), Chemba DC [155 (105 – 212.5)] and Kondoa DC [151.3 (113.8 – 205)]. Similarly, the overall scores for labour wards were also relatively high in Kondoa TC, Chemba DC and Kondoa DC, with the difference being statistically significant *(chi2 = 75.475, p-value <0.001)* (Tables 2 & 3).

Table 2: Hand hygiene scores and levels by district councils in Dodoma region

District council	Median score (IQR)	Hand hygiene level
Kondoa TC	205 (180 – 230)	Basic
Chemba DC	155 (105 – 212.5)	Basic
Kondoa DC	151.3 (113.8 – 205	Basic
Dodoma MC	102.5 (75 – 175)	Inadequate
Bahi DC	70 (55 – 111.3)	Inadequate
Chamwino DC	67.5 (55 – 105)	Inadequate
Kongwa DC	65 (55 – 80)	Inadequate
Mpwapwa DC	47.5 (35 – 60)	Inadequate
Overall	80 (60 – 145)	Inadequate

Table 3: Hand hygiene scores and levels in labor wards by district councils in Dodoma region

District council	Median score (IQR) in labor wards	Hand hygiene level in labor wards
Kondoa TC (n=3)	190 (175 - 230)	Basic
Chemba DC (n=28)	186.3 (112.5 - 213.8)	Basic
Kondoa DC (n=26)	156.3 (115 - 207.5)	Basic
Dodoma MC (n=27)	110 (70 -175)	Inadequate
Bahi DC (n=27)	70 (55 -115)	Inadequate
Chamwino DC (n=29)	65 (55 - 100)	Inadequate
Kongwa DC (n=28)	60 (40 - 67.5)	Inadequate
Mpwapwa DC (n=27)	45 (35 - 60)	Inadequate
Overall (n=195)	75 (55 – 145)	Inadequate

n=number of labor wards evaluated

3.4 Evaluation of hand hygiene indicators in health facility units

Evaluation of hand hygiene indicators in health facility units in various district councils revealed that, system change had the highest median score (IQR) of 40 (30 – 50), followed by evaluation and feedback [15 (15 – 30)]. Despite appreciable variations across districts councils; Kondoa DC, Chemba DC and Kondoa TC scored high in all five hand hygiene indicators (Table 4).

Table 4: Performance evaluation in various district councils by components of hand hygiene indicators

District council	Hand hygiene assessment indicators				
	SC, median score (IQR)	ET, median score (IQR)	EF, median score (IQR)	RW, median score (IQR)	ISC, median score (IQR)
Kondoa TC	39.3 ± 6.1*	25 (20 – 35)	60 (50 – 65)	27.4 (25 – 32.5)	55 (40 -70)
Chemba DC	45 (30 – 50)	15 (5 – 30)	40 (25 – 55)	15 (0 – 30)	40 (35 – 45)
Kondoa DC	40 (35 – 50)	5 (0 – 20)	45 (20 – 60)	22.5 (15 – 32.5)	40 (30 – 42.5)
Dodoma MC	45 (40 – 50)	10 (5 – 20)	20 (15 – 35)	15 (0 – 30)	10 (0 – 20)
Bahi DC	40 (37.5 – 45)	0 (0 – 15)	15 (15 – 25)	0 (0 – 35)	0 (0- 0)
Chamwino DC	45 (40 – 50)	0 (0 – 10)	15 (15 – 25)	0 (0 – 20)	0 (0 – 5)
Kongwa DC	35 (25 – 45)	5.0 ± 1.9*	13.7 ±6.0	5 (0 – 5)	5 (5 -10)
Mpwapwa DC	25 (17.5 – 35)	5 (0 -5)	14.2 ±4.7)*	0 (0-5)	0 (0 – 5)
Median score (IQR), n	40 (30 – 50)	5 (0 – 15)	15 (15 – 30)	5 (0 – 25)	5 (0 – 35)

*Total score in each indicator (n)=100; *Mean ± standard deviation; DC=District council; SC= System change; ET= Training and Education; EF= Evaluation and Feedback; RW= Reminders in the Workplace; ISC=Institutional Safety Climate*

Evaluation of hand hygiene indicators in health facility units by ranks also showed high score in system change, followed by evaluation and feedback. On the other hand, Training and Education, as well as Institutional Safety Climate had the lowest scores. Interestingly, Reminders in the Workplace had significantly higher score in hospitals compared to health centres and dispensaries (*chi2= 10.275; p-value= 0.006*) (Table 5).

Table 5: Performance evaluation of health facility ranks by components of hand hygiene indicators

Hand hygiene assessment indicators	Hospitals	Health centres	Dispensaries
System change, median score (IQR)	45 (40 – 57.5)	32.5 (25 – 40)	40 (30 – 45)
Training and Education, median score (IQR)	10 (5 – 17.5)	5 (5 – 10)	5 (0 -15)
Evaluation and Feedback, median score (IQR)	20 (15 – 35)	15 (15 – 25)	15 (15 – 30)
Reminders in the Workplace, median score (IQR)	22.5 (5 – 31.5)	5 (0 – 17.5)	5 (0 -22.5)
Institutional Safety Climate, median score (IQR)	2.5 (0 – 20)	5 (0 – 12.5)	5 (0 -35)

Total score in each indicator (n)=100

3.4.1 System change indicator among health workers in various units

The continuous supply of clean and running water was observed in approximately 82.8% (216/261) of units, and interestingly, approximately three quarter of these had soap available at each sink. The sink: bed ratio was at least 1:10 in 109 (70.1%) units, this included the conventional sinks and improvised sinks (Figures 7 and 8).

Figure 7: Hand washing facilities (Left: Improvised sink; Right: conventional sink) in the health facilities in Dodoma region. *Photo credit to Dr Shabani Hamada (left) and Abubakari Fakhi (right).*

Figure 8: Hand wash sink in one of the health facility which is not in use in Dodoma region.

Photo credit to Abubakari Fakhi.

Despite the fact that 245 (93.9%) of respondents mentioned that there was a dedicated/available budget for procurement of hand hygiene products, three quarters of health facility units did not have alcohol-based hand rub. Only 30 (11.5%) units were reported to have facility-wide continuous supply of alcohol-based hand rub (Table 6).

In the light of these, there was significantly more availability of water supply than alcohol-based hand rub for hand hygiene in health facilities [82.8% versus 23.3%, respectively *(p <0.001).*

Table 6: Availability of alcohol based hand-rub

Availability of alcohol based hand-rub	Number (n)	Percentage (%)
Not available	200	76.6
Available in some units or in discontinuous supply	31	11.9
Available facility-wide with continuous supply	14	5.4
Available facility-wide with continuous supply and at the point of care in majority of units	5	1.9
Available facility-wide with continuous supply at each point of care	11	4.2
Total	261	100.0

3.4.2 Training and education indicator among health workers in various units

Approximately 82.7% (216/261) workers reported to have not received training regarding hand hygiene (Figure 9). Of the 261 health workers interviewed in facility-wide units, the proportions of units reported to have the following documents were; *'Hand Hygiene Technical Reference Manual'* (94, 36.0%); *'WHO Guidelines on Hand Hygiene in Health-care:*

A Summary' (128, 49.0%); *'WHO Hand Hygiene Technical Reference Manual* (20, 7.7%) and *The WHO 'Glove Use Information' Leaflet* (3, 1.2%).

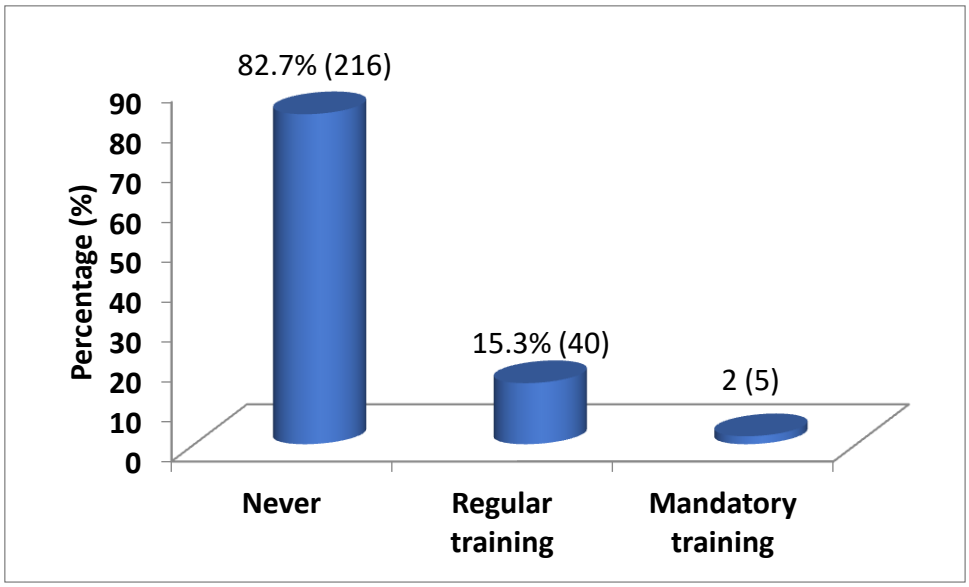


Figure 9: Frequency of health care workers training using WHO multimodal hand hygiene improvement strategy or similar material

3.4.3 Evaluation and feedback indicator among health workers in various units

Approximately 90.8% of respondents acknowledged the presence of regular (at least annual) ward-based audits to assess the availability of hand hygiene resources (and in particular sinks, running water and availability of soaps). Indirectly monitoring of frequency of hand hygiene compliance regularly on the available resources such as consumption of soap was reported in 229 (87.7%) of participants; on the other hand, the direct observation of hand hygiene compliance performed using the WHO Hand Hygiene Observation tool (or similar technique) had never been observed in 205 (78.5%) of participants. Of the 56

(21.5%) of health workers who responded to have participated in hand hygiene compliance monitoring, only 2 (3.7%) reported to have compliance rate above 81% (Figure 10).

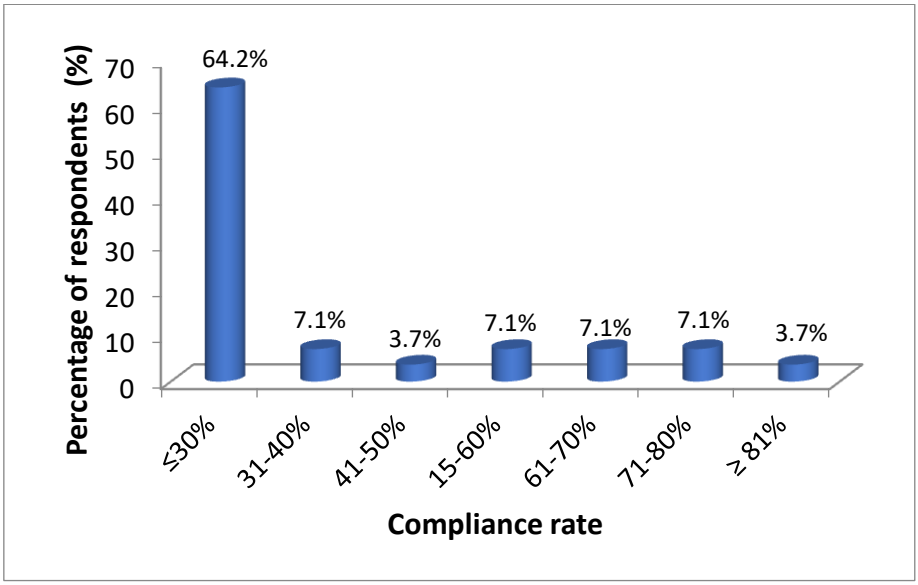


Figure 10: Self-reported hand hygiene compliance using WHO tool (or similar techniques) among health workers (N=56)

Majority of respondents did not report on the availability of immediate feedback (79.3%) on hand hygiene compliance observation session. Also, there was no systematic feedback given to health workers (79.3%) and to the facility leadership (80.1%) on hand hygiene indicators to demonstrate trends over time.

3.4.4 Reminders in the Workplace indicator among health workers in various units

There were no poster explaining the indications for hand hygiene in 198 (75.7%) units; no poster explaining the correct use of hand rub in 237 (90.1%); and no poster explaining the correct hand-washing techniques in 136 (52.1%). Similarly, hand hygiene information leaflets were not available in 256 (98.1%) units (Figure 11).

Figure 11: A photocopied poster on how to wash hand in one of the health facility in Dodoma Municipal. *Photo credit to Dr Shabani Hamada.*

3.4.5 Institutional Safety Climate for Hand Hygiene indicator among health workers in various units

There was a dedicated team established with regard to the promotion and implementation of optimal hand hygiene practice in only 14 (5.4%) units; and as a result in most cases hand hygiene practices were reported to be informally conducted under the umbrella of other activities.

CHAPTER FOUR: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 DISCUSSION

5.1.1 Demographic information of participants, health facilities and units in Dodoma region

A total of 261 health workers representing 261 various units in health facilities in Dodoma region were interviewed and majority of these were females (72.7%) and nurses by profession (59.0%). The predominant of nurses and females in various health facilities have been also reported in previous reports in Ethiopia and China (Kolola and Gezahegn, 2017, Shen et al., 2017); and may be related to their direct involvement in wide range of activities of patients care in hospitals. However, the current assessment involved many health facilities, as opposed to the two studies in Ethiopia and China which were single-centered. As a matter of fact, the current assessment has added value in terms of wide applicability of its findings to dispensaries, health centres and hospitals. The current assessment involved six units (labor wards, outpatient units, theatres, pharmacy units, surgical wards and laboratories), with labor wards accounting for approximately three quarters of all units. Previous studies have also been conducted in various units in Ethiopia, China and Swiss reiterating the need for wide coverage of units in the context of generalization of the findings and *"leaving no unit behind"* in hand hygiene advocacy and patient safety (Kolola and Gezahegn, 2017, Shen et al., 2017, Staines et al., 2018).

5.1.2 Hand hygiene levels in 261 health facility units in Dodoma region

The overall hand hygiene level in Dodoma region was inadequate, only 27.6% and 2.3% units had basic and intermediate levels, and none of the units had advanced hand hygiene

level. Performance also increased significantly in the health facility hierarchy i.e lowest in dispensaries and highest in the hospitals. Despite alarmingly low hand hygiene level, Kondoa DC, Kongwa DC and Kondoa TC managed to have overall basic hand hygiene level in their health facility units, emphasising the feasibility of hand hygiene good performance in health facilities irrespective of their geographical location. Indeed, similar results in these three councils were also exemplified when specific analysis to labor wards (as a representative unit which exists in all ranks of health facilities) was done. High level of performance in hospitals as opposed to health centres and dispensaries may be related to the fact that, most hospitals are well equipped with material resources, have more number of human resources, and have more access to information regarding to hand hygiene. This was also supported by finding of significantly more reminders in the work place like posters in hospitals as opposed to health centres and dispensaries. This in turn calls for expansion of these services equally in ranks of health facilities. The current findings have pivotal significance to the health workers, respective health facilities and the government at large; as inadequate hand hygiene level poses a threat to continuous transmission of HCAI, which in turn translate into negative health and economic burdens to patients, health facilities and the government as previously reported (Allegranzi and Pittet, 2009, Nejad et al., 2011). The current assessment did not assess the causal-relationship between inadequate level of hand hygiene and HCAI, but it's obvious from previous studies both in Dodoma (De Nardo et al., 2016) and other hospitals in Tanzania (Blomberg et al., 2007, Kayange et al., 2010, Moremi et al., 2018), that these infections are alarming and require prompt IPC interventions. To reiterate these, a study in Dodoma among women post-caesarean section revealed that nearly half of the women get surgical site infections and similarly, studies in Mwanza and

Dar es salaam in Tanzania showed that nearly 20% of children (and in particular neonates) die of MDR bacteria septicaemia of nosocomial in origin (De Nardo et al., 2016, Blomberg et al., 2007, Kayange et al., 2010). Moreover, a recent study among patients with surgical site infections in Mwanza revealed a potential source of MDR pathogens to be environmental premises in the hospital (Moremi et al., 2018). Therefore, in the light of morbidity, mortality and cost implications related to HCAI reported in Tanzania and in line with the current inadequate level of hand hygiene in most units in Dodoma regions, there is an urgent need to institute WHO recommended guidelines on hand hygiene to ensure patient safety followed by re-evaluation of the performance of these health facility units.

5.1.3 Evaluation of hand hygiene indicators in health facility units

System Change, and Evaluation and Feedback were two indicators with high hand hygiene scores as opposed to the other three indicators namely Training and Education, Reminders in the Workplace, and Institutional Safety Climate for Hand Hygiene. Despite appreciable variations across districts councils; Kondoa DC, Chemba DC and Kondoa TC scored high in all five hand hygiene indicators. Therefore, when setting hand hygiene interventional strategies, these three indicators should be given priority in Dodoma region. Moreover, the findings of basic hygiene level in the three district councils need further assessment as potential champions for change in other councils in Dodoma regions. It should also be emphasised that Kondoa district was recently hit by Cholera outbreak and some respondents reported that training and resources provided during Cholera outbreak response improved their performance in hand hygiene.

Evaluation of material resources required for hand hygiene revealed that, in most health facilities there was a continuous supply of clean water through conventional or improvised sinks. However, similar to another study in Ethiopia, only 11.5% units in this assessment reported to have facility-wide continuous supply of alcohol-based hand rub (Kolola and Gezahegn, 2017). The current assessment did not delineate the root cause of this low usage of alcohol-based hand rub, but other studies have showed individual, institutional or government policy being possible factors on hand hygiene practices. For example, a study in China showed that skin irritation and dryness, inadequate of paper towels, cold tap water and heavy work load negatively affected hand hygiene practices among health workers (Shen et al., 2017). Therefore, assessment of the specific individual, institutional and government factors affecting hand hygiene will be of interest in the future assessments in Dodoma region before and after interventions.

Over three quarters of health workers interviewed had not received formal training based on WHO multimodal hand hygiene improvement strategy or similar materials; and less than half (7.7% to 49%) had WHO documents such as '*Hand Hygiene Technical Reference Manual*', *'WHO Guidelines on Hand Hygiene in Health-care: A Summary', 'WHO Hand Hygiene Technical Reference Manual'*, and *The WHO 'Glove Use Information' Leaflet.* There were also no specific teams in approximately 94.6% dedicated with regard to the promotion and implementation of optimal hand hygiene practice. Moreover, majority of units did not have posters showing various steps in hand hygiene practices, for example posters for indications for hand hygiene and for correct hand-washing techniques were found in only 75.7% and 52.1%, respectively. Therefore, the triad of lack of lack of specific training on hand hygiene, lack of reminders in the workplace and lack of dedicated teams may account

for the overall inadequate hand hygiene level in Dodoma region, calling for an immediate intervention to ensure patient safety.

Regarding evaluation and feedback, ward-based audits to assess the availability of hand hygiene resources (and in particular sinks, running water and availability of soaps) were reported in majority of units. There was a predominance of indirectly monitoring of hand hygiene compliance (87.7%) as opposed to the direct observation of hand hygiene compliance performed using the WHO Hand Hygiene Observation (21.5%). Only 3.7% of 56 health workers who have participated in hand hygiene compliance monitoring WHO tool (or similar technique) reported to have an ideal compliance rate above 81% required by WHO. This is indeed low compared to the baseline compliance rates reported in Ethiopia (22.0%), China (66.3%), Swiss (61.4%) and in a systematic review involving 96 studies (40%) (Kolola and Gezahegn, 2017, Shen et al., 2017, Staines et al., 2018, Erasmus et al., 2010). The variations across countries may be related to the individual, institutional and government differences with regard to the hand hygiene resources availability and reinforcement modalities available in each setting. Interestingly, in other countries where baseline assessment was done followed by specific hand hygiene intervention, the re-assessment showed remarkably high hand hygiene compliance rate irrespective of the health workers' profession and hospital units (Kolola and Gezahegn, 2017, Shen et al., 2017, Staines et al., 2018, Erasmus et al., 2010). Therefore, this calls for hand hygiene practices reinforcement strategic interventions in various health facilities in Dodoma region, but with specific emphasis on three indicators namely Training and Education, Reminders in the Workplace, and Institutional Safety Climate for Hand Hygiene.

5.1.4 Limitations of hand hygiene baseline assessment

This assessment did not evaluate all health facilities in Dodoma region because of heavy rainfall (Figure 12), nevertheless, over 85% of health facilities were evaluated making generalization of the findings to the rest of the facilities credible.

The assessment was cross sectional in nature; and therefore could not establish variability of hand hygiene levels with time in these health facilities.

Figure 12: Heavy rainfall and poor infrastructure in some places hindering data collection process. *Photo credit to Dr Shabani Hamada*

5.2 CONCLUSIONS

The overall hand hygiene level in Dodoma region was inadequate, with relatively high hand hygiene scores in hospitals compared to health centres and dispensaries. Kondoa TC, Chemba DC and Kondoa DC had significantly high hand hygiene scores (at basic hand hygiene level) compared to other district councils.

The System Change, and Evaluation and Feedback, had relatively higher scores compared to Training and Education, Reminders in the Workplace, and Institutional Safety Climate indicators. Majority of health facilities had a continuous supply of water; with very few observed to have alcohol-based hand rub. Self-reported hand hygiene compliance rate and presence of dedicated teams established with regard to the promotion and implementation of optimal hand hygiene practices remained extremely low in majority of health facilities.

5.3 PROJECT SIGNIFICANCE AND RECOMMENDATIONS

This baseline assessment has generated baseline information on hand hygiene level across various health facilities in Dodoma region, which in turn will guide specific hand hygiene and IPC interventional measures. In this regard, individual, institutional and governmental policy key gaps have been identified (mostly in Training and Education, Reminders in the Workplace and Institutional Safety Climate indicators; and in lower health facilities) to allow future specific interventional measures.

Generated baseline information will be pivotal in future hand hygiene re-assessments to delineate the change in trends regarding hand hygiene levels in the context of IPC.

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APPENDICES

Appendix i: List of health facilities which participated in Dodoma region

Team	Area	Hospital	Health centres	Dispensaries
1	Dodoma MC	Dodoma RRH, St Gemma, Milembe & DCMC	Makole hc, Mkonze, Hombolo & Kikombo	Chamwino, Kitelela, Matumbulu, Mpunguzi, Ntyuka, Chahwa, Chihanga, Ipala, Nzasa, Chilolo, Mapinduzi, Mtumba, Nghonghona, Chigongwe, Lugala, Mbabala a, Mbalawala, Michese, Nala & Zuzu.
	Bahi DC	0	Bahi, Chipanga, Mundemu,& Mwiitkira	Bahi Makulu, Ibihwa, Mindola, Mnkhola, Mpinga, Mpinga, Mzogole, Chali Isangha, Chiguluka, Chimendeli, Nghulugano, Mpalanga, Zejele, Kisima Cha Ndege, Lumaiti, Lukali, Babayu, Bankolo, Mkondai, Msisi, Isangha, Ibughule, Mphangwe, Nkhome, Kagongo, & Chibelela
	Chamwino DC	0	Chamwino, Haneti, Mpwayungu, Mlowa barabarani & Itiso	Idifu, Miganga, Chanoje, Ilangali, Mlebe, Mvumi makulu, Nghahelezi, Loje, Mlowa bwawani, Manzase, Nkwenda, Chinangali I, Chilonwa, Wilunze, Chenene, Makangwa, Manchali, Handali, Chalinze, Buigiri, Mloda, Iringa-Mvumi & Segala
2	Kondoa TC	Kondoa DH	0	Bolisa, Kolo, Kingale & Mongoroma
	Kondoa DC	0	Kisese, Mnenia & Busi	Mkekena, Bereko, Kikilo, Kikore, Hurui, Masawi, Makirinya, Masange, Salanka, Buluku, Humai, Chololo, Sakami, Thawi, Bumbuta, Chubi, Itawsi, Kisaki, Hebi, Kinyasi, Pahi, Kiteo, Kinyabi & Kwadelo
	Chemba DC	0	Kwamtoro, Makorongo, Hamai & Mrijo	Mpendo, Chambalo, Kidoka, Goima, Msaada, Itolwa, Mrijo juu, Lalta, Kinyamshindo, Sanzawa, Moto, Jogolo, Babayu, Farkwa, Chase, Gwandi, Tumbakose, Gonga, Maziwa, Mondo, Churuku, Tandala & Kalema
3	Kongwa DC	Kongwa	Ugogoni, Mkoka, Kibaigwa & Mlali	Chingwingwili, Lukaila, Mautya, Mtanana A,Ndalibo, Sejeli, Banyibanyi, Hogoro, Makawa, Mkutani, Leganga, Pingalame, Chamkoroma, Iduo, Kibaigwa, Lenjulu, Manyata, Moleti, Ndurugumi, Ngomai, Pandambili, Vihingo, Mkoka & Lengaji
	Mpwapwa	Mpwapwa	Kibakwe, Mima & Rudi,	Ipera, Mtera, Seluka, Mtamba Chipogoro, Godegode, Inzomvu Kiegea, Mbori, Mwanakianga, Ng'hambi, Berege, Sazima, Makoje, Gulwe, Ikuyu, Kisima, Igoji, Chitemo, Mazee & Wiyenzele.
Total	**8**	**7**	**27**	**165**

Appendix ii: Consent Form

Introduction

I am…….. , a researcher/research assistant from Health Promotion and System Strengthening/Tuimarishe Afya Project in Dodoma and Swiss Centre for International Health conducting a study on "**Hand Hygiene Self-Assessment across Health Facilities in Dodoma Region: A baseline assessment using WHO Multimodal Hand Hygiene Improvement Strategy".**

Purpose of the Study

This baseline assessment is expected to establish the baseline information on hand hygiene status across health facilities in Dodoma Region, Tanzania and thus will bring attention to key stake holders on the level of on hand hygiene to allow institution of specific infection control and prevention (IPC) measures relevant to the health facilities.

Procedures

If you agree to participate in this baseline assessment, you will be asked some questions about your health facility basing on the WHO Hand Hygiene Self-Assessment Framework 2010. The assessment will take approximately 45 to 60 minutes. Your decision to participate in this study is voluntary and you can withdrawal yourself from the interview at anytime, if you wish to do so. But, we kindly request you to participate because information obtained will be important to guide future IPC in this health facility. You will not incur any direct costs as a result of participating in this study.

Confidentiality

The information obtained from you and your health facility will be kept confidential and will be used for the purpose of improving IPC measures. Results may also be published in scientific journal but will not use your identity and identity of your health facility (anonymous codes with be used instead of names or any other identifying information). If you have any questions about this study you can contact me at any time through this address; Fiona Chilunda (HPSS) (+255 784 459055) or Vicky-Sidney Msamba (+255 763 770855); and in case your inquiries are not addressed, kindly contact or Chairperson of The Joint CUHAS/BMC Research and Ethics Committee (+ 255 28 250 0881).

Participant Consent

I have read about This baseline assessment, my questions/queries/inquiries have been answered to my satisfaction. In case, I have more question, I will contact the researcher/research assistant. Therefore, I voluntarily agree / disagree to participate in this study.

Initials of interviewee……

Signature ……...Date……

Name of Person Obtaining Consent……

Signature……Date……

Appendix iii: WHO Hand Hygiene Self-Assessment Framework 2010

(eight pages of this tool to be attached)