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**AAU COLLEGE OF HEALTH SCIENCE SCHOOL OF MEDICINE  
DEPARTEMENT OF ANESTHESIOLOGY, CRITICAL CARE AND PAIN  
MEDICINE**

**KNOWLEDGE, PRACTICE OF HAND HYGIENE AND ASSOCIATED  
FACTORS WITH NON-COMPLIANCE OF HAND HYGIENE AMONG  
ANESTHESIA PROVIDERS WORKING IN TASH OPERATING ROOMS**

By - Dr. Mohammed Mahmud (MD, Anesthesia Resident)

**December 2020**

**Addis Ababa, Ethiopia**

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A Thesis to be Submitted to Addis Ababa University School of Medicine  
Department of Anesthesiology, Critical Care & Pain Medicine in Partial  
Fulfillment for the Requirement of Specialty Certificate of Anesthesiology, Critical  
care and Pain Medicine

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Addis Ababa, Ethiopia

## APPROVED BY THE BOARD OF EXAMINATION

The thesis here, entitled “Knowledge, Practice of Hand Hygiene and Associated Factors with Non-compliance of Hand hygiene Among Anesthesia Providers working in TASH Operating rooms.” is accepted in its present form by the board of examiners as partial fulfillment of the requirement for specialty certificate in Anesthesiology Critical Care and Pain Medicine.

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STATEMENT OF DECLARATION

I here declare and affirm that this research is my original work as a partial fulfillment of the requirements for the specialty certificate training in Anesthesiology. I have followed all the ethical considerations in the preparation, data collection, data analysis and completion of this research. All the sources of the materials used for this research and all people and institutions who gave support for this work are fully acknowledged.

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## **SUMMARY**

**Background:** Hand hygiene is an important measure that can be taken by the anesthesia providers to prevent and control infection in the operating room. The identification of several risk factors associated with poor hand hygiene compliance is also of extreme importance.

**Objective:** The objective of this study was to assess the knowledge, practice of hand hygiene and the associated factors with the non-compliance of hand hygiene among anesthesia providers working at TASH operating rooms.

**Method:** Institutional based cross-sectional study design was used. The study was conducted at Tikur Anbessa Specialized Hospital which is found in Addis Ababa Arada sub city. The study population were all Anesthesia providers working in TASH operating rooms and data was collected using self-administered questionnaire from all Anesthesia providers and the data was entered and analysed using SPSS version 26.

**Results:** A Total of 101 study participants filled the questionnaires with a response rate of 100%. The overall assessment of knowledge showed that the majority (60.4%) of the respondents had good knowledge where as 39.6% of the respondents had poor knowledge regarding hand hygiene. Regarding the practice of HH, it was found out that 35.6% of the respondents had good practice while 64.4% of the respondents had poor practice of hand hygiene. Among the identified factors for non-compliance to HH, it was found out that 78.2% of the respondents mentioned that being too busy was the most important factor for being non-compliant to HH.

**Conclusions:** The overall hand hygiene compliance among the anesthesia providers working in TASH were found to be poor even though their overall knowledge level was found to be above average.

**Keywords:** Knowledge, Practice, hand hygiene

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## Acronyms

ABHR.....	Alcohol Based Hand Rub
ASA.....	America Society of Anesthesiologists
HAI.....	Hospital Acquired Infection
HCAI.....	Health Care Associated Infection
HCW.....	Health Care Worker
HH.....	Hand Hygiene
KAP.....	Knowledge Attitude Practice
MOH.....	Ministry Of Health
OR.....	Operating Room
TASH.....	Tikur Anbessa Specialized Hospital
WHO.....	World Health Organization

# **1. Introduction**

## **1.1 Background**

Hand hygiene is a general term that applies to either hand washing with plain soap and water, antiseptic soap and water, antiseptic hand rub or surgical hand antisepsis(WHO 2009a:4). It is one of the most reliable and cheapest way to avoid transmission of infection. Hand hygiene has a lots of advantages including prevention of infection related extended hospital stay, long term morbidity, increased resistance to antibiotics, the economic burden and the psychological impact on the patient as well as their families (1).

World Health Organization has come with the idea of “My five moments for hand washing” in the year 2009(1). This concept aims to tackle the gaps that are identified with regard to poor hand washing technique. The five moments include:

1. Before touching the patient
2. Before performing aseptic technique
3. After exposure to body fluids
4. After touching a patient
5. After touching the patient’s surrounding

During provision of anesthesia, there are a lot of activities done which have direct interaction with the patient. This will pose a high opportunity for the transmission of microorganisms. Thus, it is very essential to provide to all of the anesthesia providers with a set of standards in order to decrease the risk of infection transmission while performing their routine activities (2).

One essential way to transmit infection during anesthesia provision is from contaminated hands of the anesthesia provider (3). The microorganisms can be then transferred to different parts of the anesthesia workstation including the adjustable pressure limiting valves and the volatile agent dials. In addition microorganisms can be transmitted to surfaces of the intravenous stopcock sets which in turn lead to interaction with the patient and this may be associated with increased risk of patient mortality (4).

Anesthesiologists have higher exposure to blood & body fluid while doing their routine activities in the OR (5). Despite this, several studies have shown that their compliance towards proper Hand hygiene practice was found to be poor (6, 7)

There are also several factors that make transmission of microorganisms in the anesthesia settings to be common. Some of the factors include: high burden of work with several manipulation of the anesthesia materials, confined work space, and less frequency for hand washing. Thus all anesthesia providers can contribute towards the reduction of the infection rates that occur inside the OR (8).

### 1.2 Statement of the Problem

Hand hygiene compliance among all health professional is less than 50% out of which the anesthesia providers were also found to be non compliant to hand hygiene (9).

It is well established that HCW's hands are the most common source of HCAI and the pathogenic microorganisms may stay for 2-60 min on the hands unless strict hand hygiene practice is performed (1).

There are a lots of Infection prevention guidelines which mainly advocate practice of hand hygiene before and after patient contact (10). In developing countries where the availability of soaps, sinks & towels together with being understaffed is the main reason for poor compliance of hand hygiene among the HCWs (11).

One of the main strategies in preventing the spread of HCAI is to implement a proper Hand hygiene compliance. HCAI poses a great burden worldwide. Over 1.4 million people are estimated to develop HAI of which an estimate of 90,000 deaths occurs annually (12). In developed countries, HAI ranges from 5-15% & as much as 50% of cases are admitted to the ICU (13). In developing countries, the prevalence of HAI is thought to be underestimated than the expected real figure due to lack of inadequate data. Moreover, because the diagnosis of HCAI is complex & the requirements and expertise that is mandatory to perform the surveillance activities to guide the intervention is not well organized (14). However, in poor settings, rates of

infection can exceed 20% (15). In Ethiopia, one study showed that the rate of infection in surgical wards ranges from 5.7% to 45.8% (16).

In general, the burden of HAI can be reduced with proper hand hygiene practice because one of the most important determinant factors for the development of HAI is improper Hand hygiene practice.

### **1.3 Significance of the study**

Even though there are solid evidences supporting that proper hand hygiene will improve the patient safety, reduce the cost of hospital stay and have positive impact on the patient; it is a big challenge that many health professionals particularly the anesthesia providers are still not compliant to hand hygiene. It's a well known fact that following a strict hand hygiene practice will help provide a safe patient care (WHO 2009). However, there are many studies that have identified gaps & barriers to hand hygiene among many health professionals and studies specific to anesthesia providers remain limited.

Earlier studies done to assess the relationship that link the magnitude of HAI to anesthesia setting were not specific to hand hygiene. Moreover, there are only few published studies done in our country regarding this problem. Therefore, this particular study aims to investigate the knowledge, practice of Hand hygiene and the associated factors of non-compliance to hand hygiene among anesthesia care providers working in TASH operating rooms.

## **2. Literature Review**

The emphasis towards the practice of Hand hygiene gained much attention at the mid 19<sup>th</sup> century by Hungarian Obstetrician named Ignaz Phillip Semmelweis. He noticed that puerperal fever was the most common cause of maternal mortality in the maternity ward. His conclusion to his observation was that physicians & medical students who were involved in the care of these mothers had contaminated hands. Then with subsequent intervention involving disinfection of the hands of the medical staffs, he found out that the incidence of puerperal fever declined from 16% to 3% (17).

Adherence to proper hand hygiene remains very low in different countries of the world even though the burden of HAI is increasing dramatically (18). Even in the developed countries, the

hand hygiene practice remains below average (19). For example, it is 50% in USA and it is 42% & 32% in Switzerland & UK respectively (20).

The American Society of Anesthesiologists has published a recommendation for infection control in the practice of anesthesia, in 2008. The recommendation has listed indications for hand hygiene within the anesthesia setting. It includes: before and after contact with patients, before using sterile gloves ,after contact with body fluids, broken skin, or mucous membranes, after contact with a contaminated body site, after contact with high touch surfaces in the vicinity of the patient, after removal of gloves, before eating, and after using the restroom (21).

In 1995, Tait & Tuttle have published a study on infection control measures including hand hygiene compliance among anesthesiologists. In their study, they found out that only 58% of study participants reported to have performed hand hygiene after any patient contact (22). In another study done by Askarian & Ghavanini in 2002, they tried to evaluate the adherence to infection control policies among anesthesia providers. The result of their study showed that 17.4% reported the use of glove out of which only 28.4% of them reported to have performed hand hygiene before donning their gloves (23). In the early 2000, Hajjar & Girard have described about the anesthesia related bacterial HAIs and they mentioned that the associated factors for this occurrence was not studied well (24).

In the early 2000s, many literatures published on infection control within the anesthesia setting mainly focused on safe injection practices to prevent blood borne illness because exposure of anesthesia related transmission of blood borne viral infections like Hepatitis & HIV were common (25). However, in the late 2000s, the emergence of bacterial HAI which was directly related to hand hygiene practice & the contamination of the anesthesia workstation were started to be studied. In 2012, Biddle & Shah in their study to quantify the rate of hand hygiene among the anesthesia professionals, they found out that there were approximately 40 times per hour hand hygiene opportunities but failure to perform a hand hygiene were found to be 82% (26).

Even though it is not applicable for anesthesia providers to fulfill the WHO opportunity based Hand hygiene guideline 100%, it is important to improve the hand hygiene practice to reduce the burden of bacterial transmission. Currently there is plausible evidence that attribute lack of hand

hygiene by the anesthesia provider is one of the reasons for the transmission of bacterial infections within and between patients (3, 27).

In an observational study done by Rowlands & his colleagues also showed that there are a lots of opportunities for hand hygiene that are missed by the anesthesia providers in the operating rooms (28). As it has been mentioned earlier, implementing the WHO five moments for hand hygiene in the anesthesia setting, particularly at time of induction is difficult (29). Munoz-Price et al in his study done in 2014 showed that by availing more ABHR to the anesthesia providers in the operating rooms, it was proven that the compliance for hand hygiene was increased (30). Another study done by Koff & his colleagues in 2009 to assess the methods that can be used to decrease the peripheral intravenous tubing bacterial contamination was through usage of wearable ABHR (31). A study done by petty WC, also suggested that using wearable ABHR dispensers will further advance the hand hygiene compliance among anesthesia providers (32). In a multi-site randomized controlled trial done by Koff & his colleagues in 2014, the study showed that the hand hygiene compliance have dramatically increased (8-fold) with the use of wearable ABHR dispensers as compared to the wall-mounted ABHR dispenser usage (33).

## **2.1 Knowledge of hand hygiene**

A study done in Cape coast teaching Hospital in Ghana to assess the Hand hygiene Knowledge and practices among HCWs showed that out of the 130 respondents, the majority (87.7%) of them knew that hand hygiene should be performed before touching a patient and (89.4%)also knew that hand hygiene should be done after touching a patient. The overall knowledge score showed that 29.5% of the respondents had poor knowledge, 51.2% had fair knowledge and only 19.3% had good knowledge on hand hygiene (34).

On study done in Jimma University Teaching Hospital to assess the KAP of infection prevention among Anesthesia professionals in May 2015, it was revealed that 14(82.35%) of the anesthetists had good knowledge while 3(17.64%) had poor knowledge towards Hand hygiene (35).

According to a study done in Black lion Hospital to assess hand hygiene practices & factors affecting non compliance among Nurses, it was shown that 59.72% of the respondents had good knowledge on Hand hygiene while 40.7% of them had poor knowledge (36).

In another study conducted in general hospitals found in Addis Ababa to assess the compliance of hand hygiene and its associated factors among health care providers; the result of the study showed that 368(56.5%) of the respondents had good knowledge while 122(43.5%) had poor knowledge regarding the hand hygiene guidelines(37).

On another study done to assess the Knowledge and Practices of Hand Washing among Health Professionals in Dubti Referral Hospital, Afar; it was found out that 60 (66.0%), of the respondents were knowledgeable and 31 (34.0%) of them were not knowledgeable about hand washing. Moreover, 68 (74.7%) of the respondents did not know that hand washing was mandatory even if gloves were properly worn (38).

## **2.2 Practice of hand hygiene**

Hand hygiene compliance rate among anesthesiologists were found to be only 23% as compared to a 54% rate across all other physicians (9, 22,23). This can be due to the suffocated care given by the anesthesiologist in the operating rooms. Despite this, up to 54 opportunities per hour was observed and the non-adherence rate of 83% were found out among anesthesiologists in a study conducted by Biddle C, Shah J, in 2012 to Quantify the hand hygiene practice of anesthesia providers in a busy Metropolitan OR (26).Fulfilling the WHO opportunity based hand hygiene compliance rate may not be feasible for Anesthesiologist. However, trying to improve the current hand hygiene practice is very crucial because as it has been mentioned earlier that the link between contaminated hands of the anesthesia provider & bacterial transmission is of great causative factor for patient mortality (3, 27).

According to study done at Windhoek hospital in Namibia to assess the factors associated with non-compliance to Hand hygiene among nurses working at that particular hospital; the result of the study showed that about 73%of the participants respond “Always” to 4 out of the 5 moments and 32.9% responded “Always” and 18.2% responded “Never” to moment one of the 2009’s WHO recommendations of Hand washing (39).

On study done in Jimma University Teaching Hospital to assess the KAP of infection prevention among Anesthesia professionals in May 2015, it was found out that only 5(29.41%) anesthetists clean their hands between every patient contact while 12(70.5%) did not. The study also showed

that 4(23.5%) of the anesthetists cleaned their hands before touching a patient while 5(29.4%) only cleaned their hands after touching a patient (35).

According to a study done in Black lion Hospital to assess hand hygiene practices & factors affecting non compliance among Nurses, it was mentioned on the study that 79.2% of the respondents had good practice of Hand hygiene while 20.8% of them had poor practice (36).

In another study conducted in general hospitals found in Addis Ababa to assess the compliance of hand hygiene and its associated factors among health care providers, showed that 328(50.4%) of the respondents had good hand hygiene compliance while 323(49.6%) had poor compliance (37).

On a study done to assess the Knowledge and Practices of Hand Washing among Health Professionals in Dubti Referral Hospital, Dubti, Afar; regarding the practice of hand washing, 51 (56.0%), had poor practice while 40 (44.0%) of them had good practice of hand washing (38).

On another study conducted in Bahirdar health institutions to assess the KAP of HCWs on infection prevention, the result regarding the hand hygiene practice showed that 292(82.5%) respondents had washed their hands after completing the procedure they performed while about 180(50.8%) of the respondents washed their hands before the procedure. The overall hand hygiene practice was score was found to be 244(69%) (40).

### **2.3 Factors influencing hand hygiene compliance**

There are many factors reported for the poor compliance of hand hygiene. These includes: lack of sinks, time constraints to perform hand hygiene, the patient's health condition, skin irritation by the hand hygiene products, lack of knowledge of the Hand hygiene guidelines, high burden of work etc. In developing countries, the main obstacles for the poor hand hygiene compliance are inadequate availability of soap & water and limited number of availability of sinks (41).

According to a study done at Windhoek hospital in Namibia to assess the factors associated with non-compliance to Hand hygiene among nurses working at that particular hospital, the main reason given not to be compliant with the WHO'S guideline was dryness of skin caused by Hand

hygiene agents which was reported by 57.1% of the respondents and following this was the issue of lack of paper towel which was reported by 54.7% of the respondents (39).

Another study which was done in Cape coast teaching Hospital in Ghana to assess the Hand hygiene Knowledge and practices among HCWs have identified 4 main factors that influence compliance of hand hygiene. These are: inadequate water supply (21.9%), lack of clean towels (15.1%), lack of air dryer (14%) and absence of detergents (13%) (34).

A study conducted in Bahirdar health institutions to assess the KAP of HCWs on infection prevention has identified some factors for the non-compliance of Hand hygiene practice among HCWs. These factors include: unavailability of hand washing facilities 219(38.1%), its time consuming 111(31.4%), its unnecessary if gloves are worn 39(11%) and 5(1.4%) of them thinks it's totally not necessary to wash hands (40).

On another study done to assess the Knowledge and Practices of Hand Washing among Health Professionals in Dubti Referral Hospital, Afar; it mentioned some factors for being non compliant towards hand hygiene. These factors which were given by the respondents include: 39 (42.9%) says scarcity of hand washing supplies, 23 (25.8%) mentioned work overload, and 29 (31.9%) gave shortage of time as a reason not to be compliant for hand washing (38).

### **3. Objectives**

#### **3.1 General objectives**

- To assess the knowledge & practice towards Hand hygiene and associated factors with non-compliance to hand hygiene among anesthesia providers working in TASH operating rooms

#### **3.2 Specific objectives**

- To assess the knowledge of hand hygiene among Anesthesia providers working in TASH operating rooms
- To assess the practice of hand hygiene among Anesthesia providers working in TASH operating rooms
- To assess the associated factors of non-compliance to hand hygiene among Anesthesia providers working in TASH operating rooms

## **4. Methods**

### **4.1 Study area & period**

The study was conducted at Tikur Anbessa Specialized Hospital which is found in Addis Ababa Arada sub city. Tikur Anbessa Specialized Hospital is one of the highest health facility found in the country aiming to give the health service for nearly 5 million people. It has around 700 beds and the service is given by 474 doctors, 854 nurses & 350 other health professionals. It also has 900 permanent and contract administrative staff that helps to facilitate activities of the hospital. Furthermore, almost all regional and federal hospitals in A.A are affiliated with the school of medicine through its clinical services & training sites. Currently TASH has 10 operating tables for Elective cases and 5 operating tables for Emergence cases. The study will be conducted from June to October 2020.

### **4.2 Study design**

Institutional based cross-sectional study design was employed.

### **4.3 Source Population**

The source population was all Anesthesia providers working in TASH operating rooms

### **4.4 Study Population**

The study population was all Anesthesia provides working in TASH operating rooms who fulfill the inclusion criteria at the time of the study period

### **4.5 Study unit**

An Anesthesia provider in TASH will be considered as a study unit

### **4.6 Inclusion and exclusion criteria**

#### **4.6.1 Inclusion criteria**

All anesthesia care providers working in TASH operating rooms during the study period

#### **4.6.2 Exclusion criteria**

Those anesthesia care providers who are on leave

#### 4.7 Sample size determination

The sample size is calculated using a single proportion formula by Epi-info version 7.2, considering the assumptions of the prevalence of 50% ( $p = 0.5$ ) because no similar study conducted in Ethiopia and 95% confidence interval ( $\alpha=0.05$ ), marginal of sampling error tolerated (d) 5% and 10% non-response rate was taken to calculate the sample size.

$$n = \left( Z \frac{\alpha}{2} \right)^2 \frac{p(1-p)}{d^2}$$

$$n = (1.96)^2(0.5(1-0.5))/(0.05)^2$$

$$n = 384$$

Since the sample size is less than 10,000 which is 384 therefore correction formula will used:

$$nf = \frac{ni}{1+ni/N}$$

Where nf – final sample size

ni – initial sample size

N – Sampled population

$$nf = \frac{384}{1+384/120}$$

$$= 91$$

10 percent is added as a contingency rate for the non-response rate. This makes the sample size approximately 100. The plan was to study all the anesthesia providers but only 101 anesthesia providers were available and responded during the study period.

#### 4.8 Sampling procedure and technique

All available anaesthesia care providers (101) were used in the study

#### 4.9 Study variables

##### 4.9.1 Dependent Variables

- Knowledge (good vs. poor knowledge)
- Practice (good vs. poor practice)

#### 4.9.2 Independent Variables

- Age
- Sex
- Educational level (Physician Vs Non-Physician Anesthesia care providers)
- Year of experience
- Availability of ABHR
- Access to soap & water
- Dryness of skin related to HH agents

#### 4.10 Data collection procedure

In this study, questionnaire was developed, guided by the research objectives, considering the target population (all anesthesia providers). The questionnaire was developed in English using simple basic questions and statements to enhance clarity.

#### 4.11 Operational Definitions

**Hand hygiene knowledge** – is defined as having adequate understanding about hand hygiene

**Good Knowledge:** - refers to an anesthesia care provider who scored the mean and above of the knowledge questions.

**Poor knowledge:** - refers to an anesthesia care provider who scored below the mean of the total knowledge questions value.

**Hand hygiene practices** – is defined as an act of performing hand hygiene according to a set WHO standard Guideline.

**Good hand hygiene Practice:** - anesthesia care provider who scored greater than or equal to mean score of the total hand hygiene practice questions value.

**Poor hand hygiene Practice:** - anesthesia care provider who scored less than mean score of hand hygiene practice questions value.

#### 4.12 Data analysis procedure

The Data was analyzed using SPSS version 26.

#### 4.13 Data quality assurance

Each questionnaire was checked for completeness, missed values and unlikely responses; those incomplete questionnaires were omitted from the analysis.

#### 4.14 Ethical issue

Data was collected after verbal consent was taken from the anesthesia care providers. They were informed about the objective and benefits of the study. They were asked to provide accurate and honest responses. The identification of the respondents was possible only through numerical codes so that there is anonymity and confidentiality in completing the questionnaire.

#### 4.15 Result dissemination plan

The study result will be submitted & presented to Addis Ababa University School of medicine Department of Anesthesiology, critical care and pain medicine and then will be disseminated to the concerned peer groups and finally will be published on peer reviewed scientific journals.

## **5. Results**

### **Socio-demographic description of study participants**

Out of the 103 Anesthesia care providers that were given the structured questionnaire, a total of 101 have filled the questionnaire making the response rate of 98%.The majority of the participants were male, 66.3% while 33.7% were females. The participants' age ranges from (22-60yrs) with a mean age of 31yrs.

**Table 1: Sociodemographic characteristics of Anesthesia care providers in TASH; Addis Ababa, Ethiopia, August 2020 (n=101)**

Type of Variable		Frequency(n)	Percent (%)
Age	20-30	74	73.3%
	31-60	27	26.7%
Gender	Male	67	66.3%
	Female	34	33.7%
Professional Level	Physician Anesthesia Provider	52	51.5%
	Non-Physician Anesthesia Provider	49	48.5%
Years of Practice	0-5	79	78.2%
	>5	22	21.8%

## **Hand Hygiene Knowledge**

A total of 7 structured and standardized questions was used to evaluate the knowledge of the participants toward hand hygiene using a multiple choice-based questions. Over all, Anesthesia professionals knowledge scores ranged from 14% (1/7) to 86%(6/7).

From the 7 questions replied, the highest answered question by **96(95.0%)** participants, was the recommended concentrations of alcohol sanitizer followed by 86(85.1%) participants answered correctly to the question of wearing glove can't replace hand washing. In contrary, **83(82.2%)** of the participants have poor knowledge or didn't reply correctly to the recommended duration of hand washing as shown in Table 2 below.

**Table 2 .Percent correct answer replied for specific questioners on hand hygiene by Anesthesia providers in TASH, August 2020(n=101)**

<b>Key questions</b>	<b>Correct</b>		<b>Incorrect</b>	
	<b>Frequency (n)</b>	<b>Percentage (%)</b>	<b>Frequency (n)</b>	<b>Percentage (%)</b>
1)Proper hand hygiene includes use of soap and water	22	21.8%	79	78.2%
2) Glove wearing replaces hand washing	86	<b>85.1%</b>	15	14.9%
3)"WHO 5 moments of hand washing" does not include	34	33.7%	67	66.3%
4) Recommended duration of hand washing	18	17.8%	83	<b>82.2%</b>
5) Hand sanitizer is an alternative to hand washing	52	51.5%	49	48.5%
6) Hand sanitizer is effective if used for <60s	71	70.3%	30	29.7%
7) Recommended concentration of alcohol sanitizer	96	<b>95.0%</b>	5	5.0%

The mean score for the knowledge questions on hand hygiene was found to be 54% which accounts for answering 4 out of the 7 questions and this value is taken as a cut off value for categorizing the knowledge status of the anesthesia professionals as having good or poor

knowledge. Among the all Anesthesia professionals working in TASH, the majority 61(60.4%) of them had good knowledge, as shown in Table 3 below.

**Table 3. Mean calculated Level of Knowledge by the anesthesia professionals working in TASH, August 2020(n=101)**

Computed Mean Level of Knowledge	Frequency	Percent
Good (>54%)	61	<b>60.4</b>
Poor (<54%)	40	<b>39.6</b>
Total	101	100.0

The Chai-square analysis was done to know whether there is association b/n Age, gender, professional status, year of practice with the knowledge level and it was found out that only professional status had association (p-value of 0.02) as shown in table 4 below.

**Table 4. knowledge of Anesthesia care providers in relation to Age, Gender, professional level & year of practice in TASH, August 2020(n=101)**

Independent variable	Mean Level of Knowledge Computed			p-Value (0.05)
	Category	Good	Poor	
Age	20-30	32(59.3)	22(40.7)	0.802
	>30	29(61.7%)	18(38.3)	
Gender	Male	45(67.2%)	22(32.8%)	0.051
	Female	16(47.1%)	18(52.9%)	
Professional Level	Physician	39(75%)	13(25%)	<b>0.002</b>
	Non-Physician	22(44.9%)	27(55.1%)	
Years of Experience	0-5 Yrs.	49(61.3%)	31(38.8%)	0.732
	>6 Yrs.	12(57.1%)	9(42.9%)	

From the bi-variate logistic regression analysis also only professional status was found to be strongly associated with knowledge level and being a physician anesthesia provider, the odds of having more knowledge was 3.7 times more than that of being a non-physician anesthesia provider, as shown in table 5 below.

**Table 5 Bivariate analysis of comparing knowledge of hand hygiene to independent variables among anesthesia providers in TASH, August 2020 n(101)**

Variables		Level of Knowledge		COR	95% C.I.for COR		p-value
		Good	Poor		Lower	Upper	
Age	20-30 Yrs	32(59.3)	22(40.7)	0.903	0.406	2.010	0.802
	>30 Yrs	29(61.7%)	18(38.3)	1			
Gender	Female	16(47.1%)	18(52.9%)	2.301	0.989	5.355	0.053
	Male	45(67.2%)	22(32.8%)	1			
<b>Level of Profession</b>	<b>Physician Anesthesia providers</b>	39(75%)	13(25%)	<b>3.682</b>	<b>1.584</b>	<b>8.555</b>	<b>0.002</b>
	<b>Non-Physician Anesthesia providers</b>	22(44.9%)	27(55.1%)	1			
Years of Practice	0-5 Yrs.	49(61.3%)	31(38.8%)	1.185	0.447	3.141	0.732
	>5 Yrs.	12(57.1%)	>6 Yrs.	1			

### **Hand Hygiene Practice**

A total of 10 key indicator questions were provided for the participants to evaluate the hand hygiene practice in their daily routine clinical practices. Based on the replies obtained, the percent adherence to comply to the standard WHO's practice of hand hygiene for the 10 provided questions is summarized on table 6 below.

The highest compliance, about **85(84.2%)** was observed to wearing gloves when intubating a patient. On the other hand, the highest non-compliance rate **86(85.1%)** was reported with the frequency of washing hands according to the WHO guideline followed by **85(84.2%)** which is washing hands before examining a patient.

**Table 6. Self- reported practices of hand hygiene among Anesthesia providers in TASH, August 2020 n(101)**

Hand Hygiene Practice Questions Provided	Complied		Noncompliance	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
1 Do you wash your hands at the beginning of every case	39	38.6%	62	61.4%
2. Do you always use water & soap to clean your hands	59	58.4%	42	41.6%
3 Do you use Alcohol based hand rub to clean your hands	30	29.7%	71	70.3%
4. How often do you wash your hands before performing an Aseptic procedures	52	51.5%	49	48.5%
5. Before examining a patient, do you always wash your hands	16	15.8%	85	<b>84.2%</b>
6. Do you wear glove when intubating a patient	85	<b>84.2%</b>	16	15.8%
7. Do you immediately remove your gloves & wash your hands	38	37.6%	63	62.4%
8. Do you wash your hands everytime you touch the patient's bed	23	22.8%	78	77.2%
9. Do wash your hands after the end of every case	50	49.5%	51	50.5%
10. Do you always wash your hands according to the WHO's guideline	15	14.9%	86	<b>85.1%</b>

The mean score for the practice questions on hand hygiene was 50% which accounts for answering  $\geq 5$  out of the 10 questions and this value was taken as a cut off value for categorizing the practice of the anesthesia professionals as being complied or Non-complied. Among the all Anesthesia professionals working in TASH, the majority 65(64.4%) of them were found to be non-complied (had poor practice), as shown in Table 7 below.

**Table 7. Mean calculated Level of Compliance to hand hygiene practice by the anesthesia professionals in TASH, August 2020 n(101)**

Level of Compliance	Frequency	Percent
Complied (Good Practice)	36	<b>35.6 %</b>
Not complied(Poor practice)	65	<b>64.4 %</b>
Total	101	100.0

From the Chi-square analysis, it was found out that there was no significant association b/n the independent variables (Age, Gender, professional status, year of experience) and the practice of Hand hygiene among Anesthesia professionals in TASH, as shown in Table 8 below.

**Table 8 . Practice of Anesthesia care providers in relation to Age, Gender, professional level & year of practice in TASH, August 2020(n=101)**

variables	Level of Practice			
	Category	Compliance	Non-Compliance	p-Value
<b>Age</b>	20-30	18(33.3%)	36(66.7%)	0.603
	>30	18(38.3%)	29(61.7%)	
<b>Gender</b>	Male	24(35.8%)	43(64.2%)	0.958
	Female	12(35.3%)	22(64.7%)	
<b>Professional Level</b>	Physician Anesthesia providers	19(36.5%)	32(65.3%)	0.847
	Non-Physician Anesthesia providers	17(65.3%)	19(36.5%)	
<b>Years of Experience</b>	0-5 Yrs.	25(31.3%)	55(68.8%)	0.072
	>5Yrs.	11(52.4%)	10(47.6%)	

Similar to the above finding , binary regression analysis also showed that there was no association found b/n the independent variables(Age, Gender, professional status, year of experience) and the practice of Hand hygiene among Anesthesia professionals in TASH

**Table 9 Bivariate analysis of comparing practice of hand hygiene to independent variables among anesthesia providers in TASH, August 2020 n(101)**

Variables		Level of Practice		Crude Odd ratio	95% C.I.for EXP(B)		p-value
		Complianc e	Noncomplianc e		Lower	Upper	
Gender	Female	12(35.3%)	22(64.7%)	0.435	0.187	1.011	0.053
	Male	24(35.8%)	43(64.2%)	1			
Age	20-30 Yrs	18(33.3%)	36(66.7%)	1.108	0.498	2.466	0.802
	>30 Yrs	18(38.3%)	29(61.7%)	1			
Level of Profession	Physician	19(36.5%)	32(65.3%)	1.084	0.480	2.449	0.847
	Non- Physician	17(65.3%)	19(36.5%)	1			
Practice (Yrs)	0-5yrs	25(31.3%)	55(68.8%)	2.420	0.910	6.436	0.077
	>5yrs	11(52.4%)	10(47.6%)	1			

### **Factors Affecting Noncompliance of Hand hygiene**

Factors affecting non compliance to hand hygiene were also assessed in this study. Among the listed risk factors for noncompliance to hand hygiene practice, it was found out that 79(78.2%) of the participants have agreed that **being too busy** was the most factor for non compliance followed by the 65(64.4%) which is **lack of access to adequate Water and Soap**, as shown in table 10 below.

**Table 10 Risk factors for noncompliance of hand hygiene practice ordered from highest to lowest factors Among Anesthesia providers working in TASH, August 2020 n(101)**

	Agree	Disagree	Neutral
Being Too Busy	79	7	15
	<b>78.2%</b>	6.9%	14.9%
Because there is no adequate water and soap	65	18	18
	<b>64.4%</b>	17.8%	17.8%
Forget to Wash	40	13	48
	<b>39.6%</b>	12.9%	47.5%
Don't think it is necessary to wash every time	16	76	8
	16.0%	76.0%	8.0%
Because hand hygiene agents cause dryness and irritation	3	86	12
	3.0%	85.1%	11.9%

## **6. Discussion**

Hand hygiene is one of the main practices that can be done among all HCWs including anesthesia providers' in order to prevent the high burden of HAIs. This is true especially in this current era of COVID-19 pandemic where Hand hygiene is the easiest and cheapest way to prevent the spread of the virus.

In this study, the most answered knowledge question was the recommended concentration of Alcohol in a standard hand sanitizer which was correctly answered by 95% of the respondents. This is probably due to the wide spread & advocacy of hand sanitizers in this era of COVID-19 pandemic.

The overall assessment of knowledge showed that the majority (60.4%) of the respondents had good knowledge towards Hand hygiene. These results were found be similar to studies done in Harar & Afar among Health professionals in which those who had good knowledge were 61% & 66% respectively(43,38).

In this study, professional status (COR=3.682, CI:1.584, 8.555) was found to have significant association with knowledge where by Physician Anesthesia providers were found to be 3.7 more knowledgeable than the non-physician Anesthesia providers. This indicates that the higher the educational level, the more knowledgeable they are.

Regarding the practice of HH, the overall compliance of hand hygiene was found to be poor (**35.6%**). This figure is lower as compared to a studies done in Bahirdar & Afar among HCWs which showed that the overall HH compliance to be 69% & 56% respectively (38,40). This may be due to the fact that anesthesia providers working in a busy Operating rooms and that adherence to the WHO's Hand hygiene guideline will be difficult as compared to other HCWs. Moreover, even in developed countries, such as USA, Switzerland, UK the overall all Hand hygiene compliance was found to be 50%, 42% & 32% respectively, which is also poor considering that WHO recommends that a 100% adherence is required. According to the WHO report which was published in 2009, it mentioned that being an Anesthesiologist is one of the poor predictor for poor hand hygiene performances (42).

Factors associated with non-compliance of HH were also assessed in the study. Among the identified factors for non-compliance to HH, it was found out that 78.2% of the respondents mentioned that being too busy was the most important factor for being non-compliant to HH whereas dryness & irritation to the skin caused by the HH agents were the least factor (3%). These findings are opposite to that of the study done in Namibia which mentioned skin dryness to HH agents to be the most important factor for the non-compliances 57.1% (39).

## **7. Strength and Limitations of the study**

### **7.1 Strength of the study**

- This particular study was not done in Ethiopia before. So it can be used as a reference for future studies
- WHO guidelines of hand hygiene were used as a standard tool to formulate the Questionnaire

### **7.2 Limitations of the study**

- The number of participants were small scale size (n=101), so it might not be applicable to other hospitals
- Observations of the study participants for proper HH practice were not done

## **8. Conclusions**

The overall hand hygiene knowledge among the anesthesia providers working in TASH was above average whereas the overall hand hygiene compliance was below average. Physician Anesthesia provider were found to be knowledgeable but their compliance toward hand hygiene was found to be poor. Overall, Adherence to WHO-guideline of Hand hygiene was also found to be poor. Most of the factors listed for being non-compliant to Hand hygiene are easy to reverse and can be adjusted with integrated tasks by the facility and the health professionals together to fulfill the recommended standard.

## **9. Recommendations**

### **To TASH**

- Training on WHO's Hand hygiene guidelines should be given to all anesthesia providers
- Local/Institutional guidelines on Hand hygiene should be developed & implemented by the hospital's Infection prevention committee.
- The hospital should also provide adequate supply of water & soaps, ABHR, sinks, towels...

### **TO MOH**

- Should formulate & implement a national strategies and policies regarding infection prevention including Hand hygiene practice
- Should monitor & evaluate hospitals for the implementation of the national guidelines
- Should collaborate with all stake holders to promote a proper HH practice in health facilities
- Should create awareness about Hand hygiene to the public

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## Annex

### Annex 1: Subject information sheet

Hello, my name is -----, I am here in behalf of Dr. Mohammed Mahmud, final anaesthesia resident at Addis Ababa University School of medicine department of anesthesia, critical care and pain medicine. He is conducting a research on “knowledge, practice of anesthesia providers towards Hand hygiene & the associated factors to non-compliance of HH Operating rooms of Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia”. He has received permission from Addis Ababa University School of medicine and Tikur Anbessa Specialized Hospital officials to conduct the study.

You are selected to participate in this study because you are currently working as an anesthesia provider in this facility. Your participation in this study will only be based on your willingness to participate. You have the right to choose not to take part in this study. If you are willing, you have the right to stop at any time or withdraw without giving any reason which you will not be subjected to any ill-treatment. There will be no direct benefit by participating in this study but in future information gathered by this study will help policy makers, programmers and researchers to give appropriate attention on issues of post-operative nausea and vomiting.

The information that you provide will be kept confidential by using only code numbers and locking the data. Only the members of the study team will have the access to the non-coded data and the data will not be used for purposes other than the study. Your willingness and active participation is very important for the success of this study.

If you need any further information or explanation regarding to the study, you can have this address to contact.

Name: Dr. Mohammed Mahmud Tel- +251-913780182

Email- mohammed.mahmud98@yahoo.com

**Annex 2: informed consent form**

Based on the understanding of the above information, are you willing to participate in this study?

- A) Yes
- B) No

If yes, Signature ----- Date-----

Data collector

Name ----- Signature -----

Questionnaire ID Number -----

Date of data collected -----

Result of data collected

- A) Completed
- B) Not completed
- C) Partially completed
- D) Refused

Checked by supervisor: Name ----- Signature -----

For further explanation, use the principal investigator's address:

Name: Dr. Mohammed Mahmud Tel- +251-913780182

Email- mohammed.mahmud98@yahoo.com

**Annex 3: English version of the questionnaire**

Addis Ababa University School of Medicine

Survey questionnaire to assess knowledge, practice of Hand hygiene & associated factors to non-compliance of HH among Anesthesia providers working at TASH operating rooms

**PART - I                      Socio-demographic Data**

1. Age :

2. Sex

A. Male

B. Female

3. Educational status

A. Bsc Anesthetist

B. MSC Anesthetist

C. Anesthesia Resident ( Year I ,II , III )

D. Consultant Anesthesiologist

4. Year of work Experience as an Anesthesia provider

( if u are still a student, mention year of education level)

**PART-II   Knowledge Question**

1. Proper Hand hygiene practice always include use of water & soap.

a. True

b. False

2. Hand washing isnot necessary if gloves are worn properly.

a. True

b. False

3. Which one of the following isnot included in the list of WHO's "my five moments of Hand washing"?

a. Before touching the patient

b. Before performing an aseptic technique

- c. After risk of exposure to body fluids
  - d. After touching the patient
  - e. After shaking hands with a colleague
  - f. All are correct
4. For how long is it recommended to wash your hands when using water & soap?
- a. 10-20sec
  - b. 30-40sec
  - c. 40-60sec
5. Alcohol based Hand Rub is another alternative to hand washing when hands are visibly soiled?
- a. True
  - b. False
6. Alcohol based Hand Rub will still be effective if used for less than 60sec.?
- a. True
  - b. False
7. What is the recommended amount of Alcohol concentration of the standard Hand Sanitizers?
- a. 20-30%
  - b. 40-50%
  - c. 60-80%
  - d. 100%

#### PART-II Practice Questions

1. Do you wash your hands at the beginning of every case?
- a. Yes, always
  - b. Sometimes
  - c. Never
  - d. occasionally
2. Do you always use water & soap to clean your hands?
- a. Yes, always
  - b. Sometimes
  - c. Never
  - d. occasionally
3. Do you use Alcohol based hand rub to clean your hands?
- a. I always use Alcohol based hand rub
  - b. I sometimes use Alcohol based hand rub
  - c. Never
4. How often do you wash your hands before performing an Aseptic procedures?
- a. Always
  - b. Sometimes
  - c. Never
  - d. Occasionally
5. Before examining a patient, do you always wash your hands?
- a. Yes always
  - b. Sometimes
  - c. Never
  - d. Occasionally
6. Do you wear glove when intubating a patient?
- a. Yes always
  - b. Sometimes
  - c. Never
  - d. Occasionally

7. If your answer to question no. 6 is “a” or “b”, do you immediately remove your gloves & wash your hands?
  - a. Yes, always
  - b. Sometimes
  - c. Never
8. Do you wash your hands everytime you touch the patient’s bed?
  - a. Yes, always
  - b. Sometimes
  - c. I don’t wash at all
9. Do wash your hands after the end of every case?
  - a. Yes, always
  - b. Sometimes
  - c. Never
10. Do you always wash your hands according to the guideline?
  - a. Yes, always
  - b. Sometimes
  - c. Never

PART – III questions on factors affecting the non-compliance to HH

1. Do you have adequate access to water & soap at your hospital?
  - a. Yes
  - b. No
2. If “No” to the above question, do you agree that this will affect your Hand hygiene practice?
  - a. Strongly Agree
  - b. Agree
  - c. Disagree
  - d. Strongly disagree
  - e. Neutral
3. Do you agree that there is adequate hand sanitizer supply at your work station?
  - a. Strongly Agree
  - b. Agree
  - c. Disagree
  - d. Strongly disagree
  - e. Neutral
4. Do you agree that there are adequate sinks for performing a proper hand hygiene at your hospital’s Operating rooms?
  - a. Strongly Agree
  - b. Agree
  - c. Disagree
  - d. Strongly disagree
  - e. Neutral
5. Do you agree that your work pressure is hindering you from practicing a proper Hand hygiene?
  - a. Strongly Agree
  - b. Agree
  - c. Disagree
  - d. Strongly disagree
  - e. Neutral
6. Does repeated hand washing interfere & interrupt patient care activities?
  - a. Strongly Agree
  - b. Agree
  - c. Disagree
  - d. Strongly disagree
  - e. Neutral

