

The National Ribat University
Faculty of Graduate & Scientific Research



**Assessment of knowledge, attitude and practice of Health
providers regarding respiratory hygiene and cough etiquette
in critical areas at Ribat Teaching Hospital in Khartoum,
Sudan, 2016**

A Thesis Submitted in the Fulfillment of the Requirement of M.Sc Degree Health
Management by Research

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Dedication

My humble effort I dedicate to my sweet and loving mother to her gentle soul, she taught me to trust in Allah, believe in myself and by her always pray, day and night, I reach this step in my life,

To my inspiring lovingfather, for earning an honest living for us and for his untiring support and assistance that makes me gets such success and honor,

To my adorable brothers and sisters,

Acknowledgment

To the living memories of National Ribat University since the time I get the bachelor degree, all my respect for all hard works to my teachers.

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Many thanks extend to National Ribat Teaching Hospital andfor the staff for their participation in this study.

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List of abbreviations

| | | |
|----|-------------------|-----------------------------------------------------------------|
| 1 | ED | Emergency department |
| 2 | ICU | Intensive care unit |
| 3 | HAI | Health care associated infection |
| 4 | H1N1 | Influenza A subtype virus (swine flu) |
| 5 | SARS | Severe acute respiratory syndrome |
| 6 | HIV/AIDS | Human immunodeficiency virus/acquired immunodeficiency syndrome |
| 7 | HBV | Hepatitis B virus |
| 8 | HCV | Hepatitis C virus |
| 9 | HSV | Herpes simplex virus |
| 10 | HEPA | High efficiency particulate air |
| 11 | CDC | Centers for disease control and prevention |
| 12 | AIIR | Airborne infection isolation rooms |
| 13 | ACH | Air exchange |
| 14 | N95,99,100 | Respirator masks |
| 15 | AJIC | American journal of infection control |
| 16 | HCW | Health care workers |
| 17 | HCP | Health care providers |
| 18 | NICU | Neonatal intensive care unit |
| 19 | ICU | Intensive care unit |
| 20 | OR | Operation room |
| 21 | RDU | Renal dialysis unit |

| | | |
|----|-------------|----------------------------------|
| 22 | HH | Hand hygiene |
| 23 | KAP | Knowledge attitude practice |
| 24 | TB | Tuberculosis |
| 25 | ER | Emergency room |
| 26 | NRTH | National Ribat Teaching Hospital |

Abstract

Introduction: This study aimed to assess the knowledge, attitude and practice of health providers towards respiratory hygiene and cough etiquette and to measure the compliance and non-compliance rate. And also to determine the factors that affect in the health provides practice.

Methodology: A cross sectional descriptive, community based study was undertaken between October 2016 to February 2017, involving 188 health providers from critical areas (ICU, ED, NICU, PRD and operation rooms) at National Ribat teaching hospital in Khartoum, Sudan. Also 80 observations of health providers were done and out of five focus group discussion were also performed.

A self- administered structural questionnaire and observational checklist and focus group discussion were done to assess knowledge, attitude and practice of respiratory hygiene and cough etiquette.

Results: among 188 respondents, knowledge of HPs was (57.25%) and attitude score (43.8%). On the other hands the compliance rate of health providers practice was only (35.8%) and noncompliance rate was (64.2%).

Conclusion: health providers at Ribat teaching hospital had adequate knowledge and poor practice of respiratory hygiene and cough etiquette.

Recommendation:

- Activation of policies and procedure in all hospital departments and conducting continuous training programs for health providers is needed to encourage them to adhere to proper practice.
- Availability of required materials (PPE) to facilitate the proper practice.

- Doing posters and visual alerts in Arabic language showing respiratory hygiene in simple way.
- Awareness of patients and visitors about respiratory hygiene and cough etiquette.
- Doing further researches to assure the proper practice and for continuous improvement.

المخلص

الأهداف: هدفت هذه الدراسة لتقييم معرفة وسلوك وممارسة الكوادر الطبية للإحتياجات القياسية التنفسية وآداب السعال ولحساب نسبة التزامهم وعدم التزامهم بهذه الاجراءات. أيضاً لتحديد العوامل التي تؤثر على ممارسة الكادر الصحي.

المنهجية: تم إنفاذ هذه الدراسة بطريقة الدراسة الوصفية المقطعية في الفترة من اكتوبر 2016 إلى فبراير 2017 , عينة الدراسة كانت 188 كادر صحي (أطباء وممرضين) في الاقسام الحرجة التالية (العناية المركزة للكبار, العناية المركزة للصغار, الطوارئ, غرف العمليات وقسم غسيل الكلى) في مستشفى الرباط التعليمي في ولاية الخرطوم , السودان. تمت ملاحظه 80 ممارسة كادر صحي و عدد 5 مجموعات مناقشة صغيرة.

تم استخدام إستبيان وقائمة ملاحظات كما اجريت أيضاً مناقشات قصيرة على مجموعات صغيرة لتحديد المعرفة والسلوك والممارسة للإجراءات القياسية التنفسية .

النتائج: بواقع 188 كادر صحي و نسبة المعرفه كانت 57.25% و السلوك 43.8 %

نسبة التزام ممارسة الكادر الصحي 35.8% و نسبة عدم الالتزام 64.2%

الخاتمة : الكوادر الصحية بمستشفى الرباط التعليمي لديهم نسبة معرفة مناسبة وممارسة سيئة للإجراءات القياسية التنفسية .

التوصيات:

- تفعيل السياسات والإجراءات في كل اقسام المستشفى وعمل دورات تدريبية دورية لتشجيع الكوادر الصحية نحو ممارسة أفضل.
- توفير معينات العمل بصورة دائمة لتسهيل افضل ممارسة .
- عمل بوسترات وإشارات مرئية باللغة العربية لتوضيح الإحتياجات القياسية التنفسية بطريقة مبسطة.
- توعية المرضى والمرافقين بالإحتياجات القياسية التنفسية .
- القيام ببحوث مستقبلاً في نفس الموضوع لمعرفة وتقييم الوضع وللعمل على التحسين المستمر.

Chapter 1

Introduction

Objectives

Justification

Problem statement

Introduction

Respiratory infection is a leading cause of seeking medical care in hospital. Upper respiratory infection is more common than lower respiratory infection. In general, the types of respiratory infections that affect travelers are similar to those in non-travelers, and exotic causes are rare (1).

These communicable diseases can then be further spread into the hospital as well as back into the community, creating a significant societal burden. The recent severe acute respiratory syndrome epidemic and H1N1 pandemic demonstrated that vaccination alone, a mainstay of infection prevention cannot completely protect communities from widespread propagation of respiratory diseases. In particular, with respect to severe acute respiratory syndrome, the strict respiratory precautions, including hand washing, were thought to be largely responsible for controlling the spread of disease (2).

There is a lot of experts tested and proved that a non-pharmacologic preventive strategies are to be considered effective. There is currently evidence regarding the use of hand washing. Despite this incontestable evidence, hand washing has only a 40% health care compliance rate around the world. Regarding respiratory infections there's many literature and all guidelines putting respiratory hygiene as corner stone as preventive methods of respiratory infection spreading. (3)

Effective respiratory hygiene in hospitals is imperative to limit the spread of dangerous respiratory pathogens, including influenza, severe acute respiratory syndrome, avian influenza, and bioterrorism agents, particularly given that these agents may not be immediately identifiable. Sustaining effective respiratory control measures is especially challenging in the critical areas such as emergency departments (ED) and intensive care units (ICU) because of patient crowding,

inadequate staffing and resources, and ever-increasing numbers of immunocompromised patients. Threat of contagion exists not only for ED patients but also for visitors, health care workers, and inpatient populations. Potential physical sites for respiratory disease transmission extend from out-of-hospital care, to triage, waiting room, ED treatment area, and the hospital at large. (4)

Standard precaution:

Is the primary strategy for minimizing the transmission of healthcare-associated infections. These measures are to be used when providing care to all individuals in hospital regardless of their complaint, confirmed or suspected infectious agents represents an increased risk of transmission. Standard precautions include:

1. Hand hygiene.
2. Use of personal protective equipment (e.g., gloves, gowns, masks).
3. Safe injection practices.
4. Safe handling of potentially contaminated equipment or surfaces in the patient environment.
5. Respiratory hygiene/cough etiquette. (3)

Respiratory hygiene/cough etiquette:

Also called respiratory standard precaution, are infection prevention measures that decrease the transmission of respiratory illness such as influenza or cold viruses in healthcare facilities where patients, employees, and visitors may not be immediately recognized as having a respiratory infection. These measures are part of the standard precautions that should be taken to prevent the spread of infectious agent.

Hygiene is typically thought of in terms of proper hand washing, body washing, and facial cleanliness. Although these practices are essential to overall cleanliness and interrupting the spread of disease, another component of good hygiene consists of practicing good hygiene etiquette.(4)

Respiratory hygiene or respiratory precaution is recommended for all patients to cover mouth and nose with a tissue when coughing or sneezing, use in the nearest

waste receptacle to dispose of the tissue after use and to perform hand hygiene (e.g., hand washing with non-antimicrobial soap and water, alcohol-based hand rub, or antiseptic hand wash) after having contact with respiratory secretions and contaminated objects/materials (4).masking and separation of patients also recommended.

Healthcare facilities should give an adherence to Respiratory Hygiene/Cough Etiquette for patients and visitors in form of providing tissues and no-touch receptacles for used tissue disposal. Also provision of conveniently located dispensers of alcohol-based hand rub; where sinks are available should be done. Also insurance of supplies availability for hand washing (i.e., soap, disposable towels) are consistently available.

Post visual alerts (in appropriate languages) at the entrance to outpatient facilities (e.g., emergency departments, physician offices, outpatient clinics) instructing patients and persons who accompany them (e.g., family, friends) to inform healthcare personnel of symptoms of a respiratory infection when they going to care providing area and to practice Respiratory Hygiene/Cough Etiquette.

Application of droplet Precautions as wearing a surgical or procedure mask for close contact in addition to Standard Precautions is mandatory when examining a patient with symptoms of a respiratory infection, particularly if fever is present. (5)

Problem statement:

- Researchers in UK estimate that if everyone routinely washed their hands, a million deaths a year could be prevented from infections.
- Hand washing can reduce the risk of respiratory infections by 16%. ⁽⁷⁾
- Respiratory infections are the leading cause of death in developing countries. Although the Global Burden of Disease Study 2020 revealed fewer deaths related to lower respiratory tract infections than 2 decades ago, too many are still dying. Infants and young children are especially susceptible.⁽⁸⁾
- Nearly three million children, mostly under 5 years of age, died of pneumonia and lower respiratory tract infections.
- In fact, pneumonia kills far more children than human immunodeficiency virus or malaria. Tuberculosis infected an estimated 8.6 million and killed 1.3 million people in 2012, primarily in sub-Saharan Africa, where the human immunodeficiency virus epidemic continues unabated. ⁽⁹⁾
- Respiratory illnesses are frequently avoidable, and prevention costs only a fraction of treatment. The ability to control and eliminate respiratory diseases worldwide relies on public health measures, which include increasing awareness, education, and capacity.
- Research is essential and improves understanding of disease processes, then allows for possible prevention. ⁽¹⁰⁾ Our research comes to assess respiratory precautions in Sudan and to compare with others done in the world.

Justification:

Low respiratory hygiene compliance among health care workers in hospitals has become a major concern in the spread of respiratory infections. Respiratory infections are sometimes costing for both patients and hospitals and it may cause severe illness and can lead to respiratory distress and death.⁽¹¹⁾

At this point respiratory hygiene comes to play an effective role in prevention and saving patients as well as health care providers in the facility.

In Sudan there's less adherence to these precautions and also There e have a lack of research in this aspect.

Objectives:

A) General:

To assess the knowledge, attitude and practice of health providers towards respiratory hygiene and cough etiquette in critical areas at National Ribat Teaching Hospital.

B) Specific:

1. To identify the compliance rate of health care providers towards respiratory hygiene and cough etiquette.
2. To recognize the presence of policies and procedures about respiratory precautions in hospital departments.
3. To know about the implementation of policies and procedures.
4. To determine the availability of PPE needed to implement the respiratory hygiene and cough etiquette.
5. To assess the role of HCPs in patients and visitors counseling.

Chapter 2
Literature review
Previous studies

Literature review

The respiratory system includes lungs, airways and respiratory muscles. Respiratory tract is divided into the upper airways and lower airways. The upper airways or upper respiratory tract includes the nose and nasal passages, Paranasal sinuses, the pharynx, and the portion of the larynx above the vocal cords. The lower airways or lower respiratory tract includes the portion of the larynx below the vocal cords, trachea, bronchi and bronchioles. The lungs can be included in the lower respiratory tract or as separate entity and include the respiratory bronchioles, alveolar ducts, alveolar sacs, and alveoli.⁽¹²⁾

Respiratory tract infections are common presentations among emergency department (ED) patients, some of whom may present an infectious risk. Commonest upper respiratory tract infections are sinusitis, otitis media, tonsillitis and laryngitis. On the other hands the most is lower respiratory tract infections are acute bronchitis and pneumonia.

Unfortunately, definitive identification of the offending agent is generally not possible at the initial ED visit. Potential respiratory agents that the 21st century emergency physician must consider include the traditional respiratory pathogens and also emerging (e.g., severe acute respiratory syndrome [SARS]), highly virulent (e.g., avian influenza virus), resistant, and even bioterrorism-related agents. Thus, within the ED there is a potentially dangerous mixture of infections with serious possible public health consequences. Threat of contagion exists for uninfected patients (in the ED, the hospital at large, and the community) and health care personnel (including ED physicians). Through implementation of the most up-to-date guidelines, health care personnel can aid in minimizing respiratory infection transmission and protect patients and other hospital personnel from infection. The potential risk for respiratory infection–related morbidity and

mortality is compounded in the ED because of the increasing number of immunocompromised ED patients. Populations at increased risk include organ transplant patients, HIV-infected patients, and post chemotherapy patients, all of whom are living longer because of improved lifesaving therapies. Crowded and understaffed EDs further elevate risk of contagion and possible public health disasters. Two potentially lethal infections that are transmitted by the respiratory route, which most emergency physicians are familiar with, are *Neisseria meningitidis* (which causes meningococemia) and *Mycobacterium tuberculosis*.⁽¹³⁾

The participation of health physicians and nurses is critical for effective responsiveness to respiratory threats in hospitals. ED personnel represent a critical link in the chain of communication and response, along the continuum from the community to the inpatient unit. Policies should anticipate responses to the complex spectrum of possible respiratory illnesses, from highly transmissible and unexpected emerging global diseases such as SARS to yearly influenza epidemics.

The term nosocomial infection is retained to refer only to infections acquired in hospitals. The term healthcare-associated infection (HAI) is used to refer to infections associated with healthcare delivery in any setting (e.g., hospitals, long-term care facilities, ambulatory settings, home care). This term reflects the inability to determine with certainty where the pathogen is acquired since patients may be colonized with or exposed to potential pathogens outside of the healthcare setting, before receiving health care, or may develop infections caused by those pathogens when exposed to the conditions associated with delivery of healthcare. Additionally, patients frequently move among the various settings within a healthcare system.⁽¹⁴⁾

A new addition to the practice recommendations for Standard Precautions is Respiratory Hygiene/Cough Etiquette. While Standard Precautions generally apply to the recommended practices of healthcare personnel during patient care, Respiratory Hygiene/Cough Etiquette applies broadly to all persons who enter a healthcare setting, including healthcare personnel, patients and visitors. These recommendations evolved from observations during the SARS epidemic that failure to implement basic source control measures with patients, visitors, and healthcare personnel with signs and symptoms of respiratory tract infection may have contributed to SARS corona virus (SARS-CoV) transmission. (15)

The CDC has developed several specific guidelines about infection control in hospitals; Precautionary measures are divided into standard precautions to be followed in care of all patients and transmission-based precautions to be used in addition to standard precautions according to the route of pathogen transmission. Transmission-based precautions include contact precautions for agents with potential transmission by direct or indirect contact; droplet precautions for agents with potential transmission by coughing, sneezing, talking, or performance of procedures; and airborne precautions for agents with potential transmission by dissemination of either airborne droplet nuclei or evaporated droplets that remain suspended in the air for long periods. Airborne transmission is relevant for small infectious particles that are 5 mm or smaller.(15)

Standard precaution (IB) applies to all patients receiving care in hospitals regardless of their diagnosis or presumes infection status:

1. Hand washing. Wash hands after touching blood, bodily fluids, secretions, excretions, and contaminated items, whether or not gloves are worn, and between patient contacts; IB.

2. Gloves. Clean non-sterile gloves to be worn when touching blood, bodily fluids, secretions, excretions, contaminated items, mucous membranes, and non-intact skin; IB.
3. Mask, eye protection, face shield. Wear during procedures and patient care activities that are likely to generate splashes or sprays of blood, bodily fluids, secretions, and excretions; IB.
4. Gown (clean, non-sterile). Use during procedures and patient care activities that are likely to generate splashes or sprays of bodily substances; IB.
5. Patient care equipment. Handle used patient care equipment soiled with patients' fluids in a manner that prevents skin and mucous membrane exposure, contamination of clothing, or transfer of microorganisms to other patients and environments; IB.
6. Environmental control. Ensure hospital has adequate procedures for routine cleaning of patient care or patient contact surfaces; IB.
7. Linen. Handle and process used linen in a manner that prevents skin and mucous membrane exposures or transfer of microorganisms to other patients and environments; IB.
8. Occupational health and blood-borne pathogens.
 - a. Use appropriate procedures when using sharp instruments; IB.
 - b. Use mouthpieces, resuscitation bags, or other ventilation devices as alternate to mouth-to-mouth resuscitation methods in areas in which the need of resuscitation is predictable; IB.

9. Patient placement. Place patient who contaminates the environment or who does not have appropriate hygiene or environmental control in a private room; IB.⁽¹⁶⁾

Rationale for Standard and Transmission-Based Precautions in healthcare settings

Transmission of infectious agents within a healthcare setting requires three elements: a source (or reservoir) of infectious agents, a susceptible host with a portal of entry receptive to the agent, and a mode of transmission for the agent. This section describes the interrelationship of these elements in the epidemiology of HAIs.

Sources of infectious agents

Infectious agents transmitted during healthcare derive primarily from human sources but inanimate environmental sources also are implicated in transmission. Human reservoirs include patients, healthcare personnel and household members and other visitors. Such source individuals may have active infections, may be in the asymptomatic and/or incubation period of an infectious disease, or may be transiently or chronically colonized with pathogenic microorganisms, particularly in the respiratory and gastrointestinal tracts. The endogenous flora of patients (e.g., bacteria residing in the respiratory or gastrointestinal tract) also are the source of HAIs.⁽¹⁷⁾

Susceptible hosts

Infection is the result of a complex interrelationship between a potential host and an infectious agent. Most of the factors that influence infection and the occurrence and severity of disease are related to the host. However, characteristics of the host-

agent interaction as it relates to pathogenicity, virulence and antigenicity are also important, as are the infectious dose, mechanisms of disease production and route of exposure. There is a spectrum of possible outcomes following exposure to an infectious agent. Some persons exposed to pathogenic microorganisms never develop symptomatic disease while others become severely ill and even die. Some individuals are prone to becoming transiently or permanently colonized but remain asymptomatic. Still others progress from colonization to symptomatic disease either immediately following exposure, or after a period of asymptomatic colonization. The immune state at the time of exposure to an infectious agent, interaction between pathogens, and virulence factors intrinsic to the agent are important predictors of an individuals' outcome. Host factors such as extremes of age and underlying disease (e.g. diabetes , human immunodeficiency virus/acquired immune deficiency syndrome [HIV/AIDS], malignancy, and transplants can increase susceptibility to infection as do a variety of medications that alter the normal flora (e.g., antimicrobial agents, gastric acid suppressants, corticosteroids, antirejection drugs, antineoplastic agents, and immunosuppressive drugs). Surgical procedures and radiation therapy impair defenses of the skin and other involved organ systems. Indwelling devices such as urinary catheters, endotracheal tubes, central venous and arterial catheters and synthetic implants facilitate development of HAIs by allowing potential pathogens to bypass local defenses that would ordinarily impede their invasion and by providing surfaces for development of biofilms that may facilitate adherence of microorganisms and protect from antimicrobial activity. Some infections associated with invasive procedures result from transmission within the healthcare facility; others arise from the patient's endogenous flora. (17)

Modes of transmission

Several classes of pathogens can cause infection, including bacteria, viruses, fungi, parasites, and prions. The modes of transmission vary by type of organism and some infectious agents may be transmitted by more than one route: some are transmitted primarily by direct or indirect contact, (e.g., Herpes simplex virus [HSV], respiratory syncytial virus, Staphylococcus aureus), others by the droplet, (e.g., influenza virus, B. pertussis) or airborne routes (e.g., M. tuberculosis). Other infectious agents, such as blood borne viruses (e.g., hepatitis B and C viruses [HBV, HCV] and HIV are transmitted rarely in healthcare settings, via percutaneous or mucous membrane exposure. Importantly, not all infectious agents are transmitted from person to person. (18)

Non pharmaceutical Interventions (NPIs):

Are actions, apart from getting vaccinated and taking medicine that people and communities can take to help slow the spread of illnesses like pandemic influenza (flu). NPIs are also known as community mitigation strategies. When a new flu virus spreads among people, causing illness worldwide, it is called pandemic flu. Because a pandemic flu virus is new, the human population has little or no immunity against it. This allows the virus to spread quickly from person to person worldwide. NPIs are among the best ways of controlling pandemic flu when vaccines are not yet available. (19)

From all literature respiratory hygiene in hospitals, including administrative, patient, and legal issues. The “Administrative Issues” section describes coordination with public health departments, procedures for effective facility planning, and measures for health care worker protection (education, staffing

optimization, and vaccination). The patient care section addresses the potentially infected patient, including emergency medical services concerns, triage planning, and patient transport. “Legal Issues” discusses the interplay between public safety and patient privacy. Physicians play a critical role in early identification, treatment, and containment of potentially lethal respiratory pathogens.

ADMINISTRATIVE ISSUES

Administrative issues surrounding respiratory hygiene apply to the entire health care facility. Physicians should take a lead role in development and implementation of policies. All health care facilities should have policies and procedures in place for respiratory infection control practice with specific operational plans for handling a large influx of potentially infectious patients in the event of a significant outbreak. When patient influx exceeds institutional capacity, plans should designate alternative triage and treatment areas either outdoors or in other nearby large-capacity facilities. Although plans may designate patient care areas that exceed hospital capacity, staffing issues may limit the ability to actually use these areas in a real event.

Community isolation and treatment facilities may also be activated. In general, community facilities will likely house and treat patients with milder disease, with the public health department coordinating these procedures and venues. Community isolation facilities should have rooms that are equipped with private bathrooms, as well as receptacles to dispose of soiled linen and contaminated waste. Personnel who work at the facility should also have N-95 respirators available, as well as disposable gowns and gloves. In general, patients at these facilities will be expected to care for themselves. Other hospital infection-control

procedures may involve cohorting potentially infectious patients (if isolation beds are not available), as well as rapidly discharging appropriate inpatients and canceling elective procedures to alleviate strain on hospital resources.

Policies to support rapid identification of patients with suspected respiratory infections that have serious public health consequences (e.g., SARS, avian influenza) should include mechanisms for definitive diagnostic testing and immediate reporting to the local health department. Contact tracing involves either active or passive monitoring.

Active monitoring consists of direct public health contact (telephone or in person), for example, once a day for exposed persons to assess for symptoms and address any needs. Passive monitoring relies on the affected person's contacting the health authorities if symptoms develop. Methods of monitoring depend on the exposure risk and capacity of the public health infrastructure. Regardless of the type of monitoring recommended all individuals in contact with a potentially infectious person need to be advised of symptoms and what to do if symptoms develop. Additionally, persons with high-risk exposures may require activity restrictions. Although the public health department would be responsible for the contact tracing process, emergency physicians need to understand these basic principles because they will likely be called on to work closely with public health departments and provide information about persons who are infected or exposed while in the ED. Telephone numbers for the local health department should be readily available in all EDs.⁽¹⁹⁾

Communication Policies should include clear designations of specific persons within the hospital who are responsible for communication with public health officials (e.g., hospital infection control officer) and dissemination of up-to-date

information to health care staff (e.g., hospital chief executive officer). Policies need to include processes for initiating communication with key public health officials after hours and on weekends and guidance about when communication should be initiated. Potential community contacts should be identified in advance and be capable of effectively communicating needs and concerns of the public.

Engineering Controls:

Engineering controls provide passive protection for healthcare workers, visitors, and patients. Measures include use of isolation rooms (including negative pressure), filtration devices, and physical separation (e.g., closing doors or cohorting). Negative pressure isolation systems prevent contaminated air from traveling to other areas of the ED or hospital, which is the most efficient method for early containment of infectious respiratory pathogens because airflow from either single rooms or small units can be controlled. However, when the organism load is extremely high, negative-pressure units may not be 100% effective, because they leave live pathogen in the air or on surfaces. Increased efficacy can be realized by supplementing negative-pressure isolation systems with a high efficiency particulate air (HEPA) filtration system. HEPA filtration systems supplement negative-pressure systems, removing fungi and bacteria greater than 0.1 μm from the atmosphere. These can be installed in ventilation ducts but Closing doors and cohorting of patients are recommended if no proper isolation room is available. Such methods proved effective in Hong Kong in early 2003, when SARS patients were cohorted into 3 separate observation wards, with no subsequent secondary transmission reported. Unfortunately, if not done properly, cohorting in open wards may contribute to increased infection, as was seen in the early Toronto SARS experience. Thus, it should be recognized that although possibly beneficial as an adjunctive measure when resources are scarce, physical separation and cohorting

do not guarantee protection. Accordingly, health care workers should use proper infection controls when visiting patients in rooms, including droplet precautions and, if indicated, personal Occupation.⁽¹⁹⁾

CDC Recommended an air handling systems for health care facilities for environmental infection control in health-care facilities as follows:

Airborne infection isolation rooms (AIIR) should have:

1. Maintain continuous negative air pressure (IB, IC)
2. Ensure rooms well sealed (IB, IC)
3. Self-closing doors (IC)
4. Ventilate so that ≥ 12 air changes/h for new AIIR (≥ 6 ACH for existing AIIR)
5. Direct exhaust air outside (IC)
6. Install incoming air HEPA filters (IB, IC)

Administrative and Work Practice Controls:

Administration of effective infection containment requires written policies and procedures and is the “second tier” in the hierarchy of infection control.

Operational policies should include explicit criteria for suspecting disease, restricting contact with patients suspected of having infection, controlling transport and high-risk procedures, quarantining of patients and contacts, contact tracing, implementing methods for disinfection, and monitoring of isolation procedures.

Procedural policies should address need for supplemental staff, education and training for health care workers, medical surveillance of exposed health care-

workers, and communication with public health officials and the general public. Rapid implementation of these policies is the key to infection control.⁽¹⁹⁾

HEALTH CARE WORKERS

Education:

Proper education of health care workers about respiratory hygiene practice is critical for effective infection control. Written policies and procedures for education and training of health care workers should be developed at the institutional level. Education topics should include infection control precautions, criteria for suspecting disease at first contact and methods for restricting contact with patients suspected of having infection, limiting and controlling patient transport, and minimizing exposure during high-risk procedures. Additional educational topics for ED providers and administrators include criteria and procedures for quarantining of contacts, protocols for disinfection and for monitoring isolation, and methods for maintaining medical surveillance of exposed health care workers.

Staffing Issues:

Providing adequate hospital staffing is important in any health care setting and personnel issues particular to infectious disasters must be given consideration in developing hospital and ED plans. All health care facilities should have policies and procedures for mobilizing and reassigning staff to more critical areas in the facility. Because health care staff may be reluctant to come to work if they believe they are at risk of contracting an infectious illness, it is critical that the facility planning measures be reviewed in advance, with contingencies and backups in place. Health care workers (particularly those working in front-line ED settings) should also be given priority for receiving vaccines or prophylactic antimicrobials,

when appropriate. Offering additional incentives to staff to come to work may also be required in certain situations. Infectious outbreaks create the additional problem that health care workers themselves may become ill. Plans for respiratory outbreaks should include regular evaluation of health care workers for infectious signs or symptoms, criteria for removing health care workers from patient care, and criteria for quarantine (either at home or in the workplace).

PATIENT ISSUES:

Concerns about the potential spread of respiratory pathogens begin at the point of entry into the health care system and continue to the inpatient setting. Emergency physicians need to be aware of the potential for infection, illness, and transmissibility in a variety of potentially high-risk environments, including emergency department (ED) and triage settings (in which historical and clinical information may be limited and risk underestimated), during performance of “high-risk” invasive airway procedures, and during patient transport to the various inpatient units throughout the hospital.⁽¹⁹⁾

ED TRIAGE AND WAITING ROOM:

The importance of implementing effective triage and ED based diagnostic strategies is underscored by experience with highly transmissible respiratory infections such as TB and SARS. Several hospital studies provide data that demonstrate that lack of either provider education or adherence to institutional guidelines or inadequate diagnostic evaluation of patients at risk results in increased risk of disease transmission. Both the World Health Organization and the CDC provide general recommendations for handling of patients with suspected respiratory infections that include having triage staff adhere to proper hand hygiene procedures and donning face masks and eye protection. If SARS or TB is

suspected, health care workers in EDs should don an N-95, 99, or 100 respirators. The degree of vigilance that should be applied to screening for respiratory infections depends on the current risk level, with the most up-to-date regional risk information based on surveillance data provided on a CDC Web site.⁽²⁰⁾

PATIENT EDUCATION:

The CDC recommends that visual education be provided at all patient entrances to the hospital during periods of heightened respiratory alert. Visual alerts (including signs, pamphlets, and other general education measures about respiratory hygiene) are proven measures that can decrease disease transmission. It is recommended that visual alerts be present in several languages (depending on the region of the country and population served) and be provided at an appropriate reading level to allow for comprehension by the majority of the population. Content of educational material should include a general description of standard respiratory hygiene methods, including hand washing, use of disposable tissues for covering mouth and nose, and staying at least 3 feet away from persons with symptoms.

There is a recent study done on 2016 and published American journal of infection control (AJIC) about Predictors of respiratory hygiene/cough etiquette in a large community in Korea, they study the knowledge and practice of general population and the influencing factors were included. No detailed data ⁽²¹⁾ also another study done in Canada and published in (AJIC) 2013 about respiratory hygiene in emergency department to determine the compliance, belief and perception. They found that the compliance rate was very low and the impact of unused of respiratory hygiene can be a major unexpected respiratory infections outbreak because the transmission of pathogen occurs before the evaluation of patient. ⁽²¹⁾

Chapter 3
Methodology

Methodology

1. Study design:

Descriptive cross sectional community based study.

2. Study area:

the study was carried out at National Ribat Teaching Hospital; intensive care unit (ICU) , neonatal intensive care unit (NICU) , emergency room (ER)department , operation room (OR) and renal dialysis unit (RDU).

3. Study population :

This study including different categories from healthcare providers; physicians, nurses, and theater assistants.

4. Study sample procedure and size:

Samples of 188 out of 280 health care providers were included in the study.

The sample size was estimated by the generic equation

$$\frac{Z^2 PQ}{\sigma^2}$$

Sigma 2

Assuming that Z equals 1.96 (a level of precision of 95%). Hence sigma equal 0.05 (a margin of error of 5%). The prevalence of knowledge about respiratory hygiene and cough etiquette was estimated (assumed) as 85%

$$n = \frac{1.96 * 1.96 * 0.85 * 0.15}{0.05} = 184.9$$

5. Duration of study :

The study was conducted in the duration from November 2016 to February 2017.

6. Data collection tools and techniques:

Data was collected by both observation and asking.

A written questionnaire of 21 Questions used and assessed knowledge and practice of respiratory hygiene and cough etiquette

The Questionnaire has been pretested among 10 HCPs from general ward at National Ribat teaching hospital (they are excluded from the study population) and questionnaires were collected, revised and some questions updated accordingly, in which some of them were not clear in language.

And observation checklist of 8 points was prepared. 80 observations were conducted involving 58 HCPs to assess the adherence to the standard procedures according to the checklist. Observational checklist done which observed the practice of health provider and general condition such as physical separation of the patient with respiratory complain from others and also the availability and accessibility of materials was assessed

Data was collected also through focus group discussion in which responses was elicited on factors affecting practice of HCPs on respiratory hygiene and cough etiquette. The participants were asked small opened questions about what they know about respiratory precautions, how they deal with respiratory ill patients, what's PPE used and how to dispose them after use, if they educate patients and visitors or not and what's the factors that affecting their proper respiratory hygiene and cough etiquette practice.

7. variables under study :

Study variables were including socio-demographic factors such as age, gender, type of HCPS, service period of HCPs, and department of the hospital. Also HCPs practice such as wearing surgical mask when handling patient with cough and fever, providence of patient with tissues and surgical mask to cover his/her nose and mouth ,hand hygiene(HH) before and after contact with patient and type of HH used when touching a patient respiratory secretions .

Observational variables were general condition such as near clean water source to the HCWs, availability and accessibility of materials (masks, tissues, gowns, gloves.....etc.) and existing practice.

8. data processing and analysis :

Data was reviewed, edited and entered into computer and analyzed by software program statistical package for social sciences (SPSS). Some variables under study were tested using chi squire test with $P < 0.05$ considerate significant.

9. Data presentation:

Data was presented in simple frequency statistical tables and figures.

10. Ethical considerations:

The study was started after taking permission from National Ribat University, Faculty of post graduate and scientific research.

Then written ethical approval from Ribat teaching hospital was obtained.

Participation was voluntary and verbal consent from health care providers was done.

Confidentiality of the data obtained was assured.

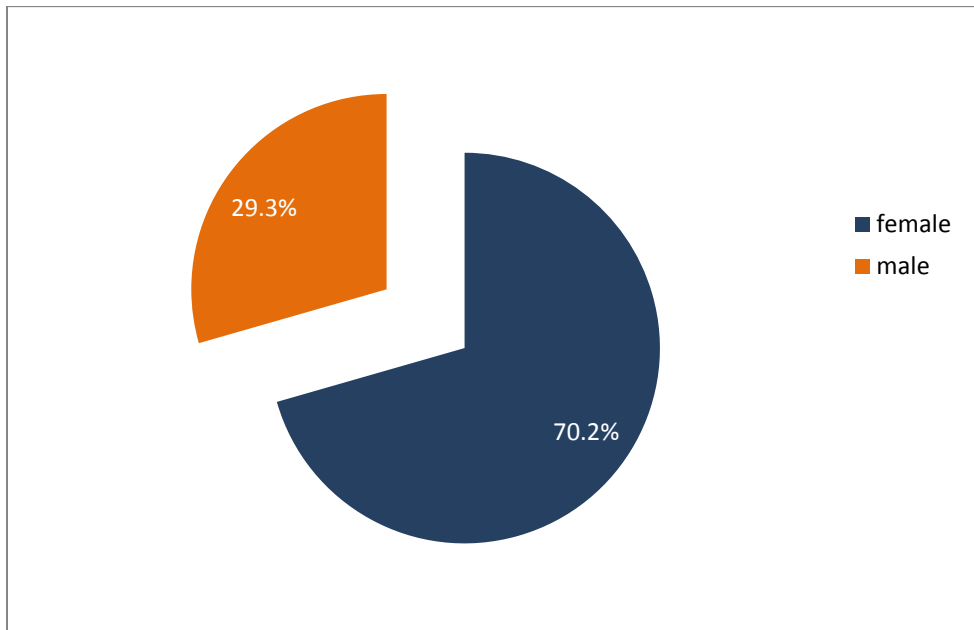
Chapter 4

Results

Results

Figure 1 gender distribution of HCPs

at NRTH in Nov. 2016

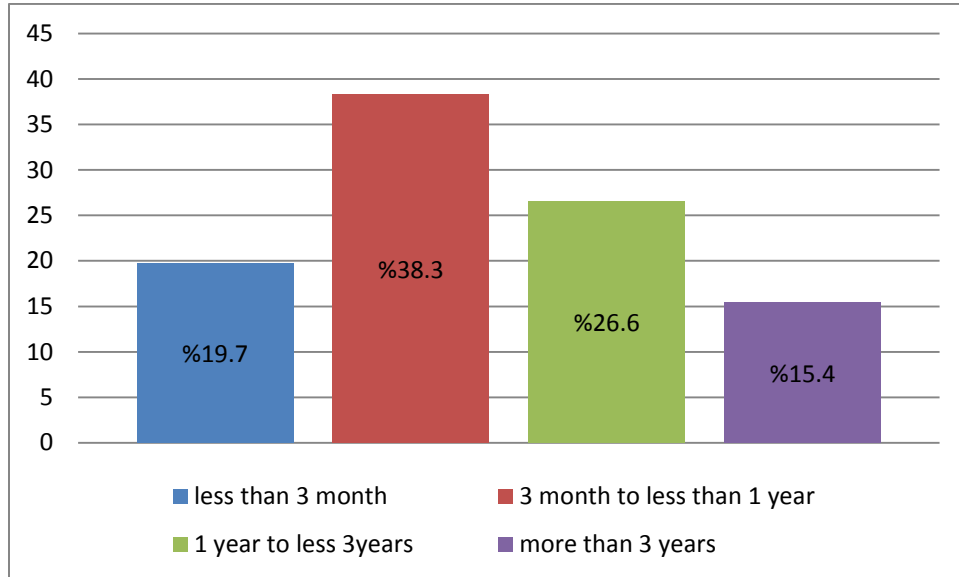


n=188

The majority of participants were female (70.2 %)

Figure 2 HCPs service period

at NRTH in Nov. 2016

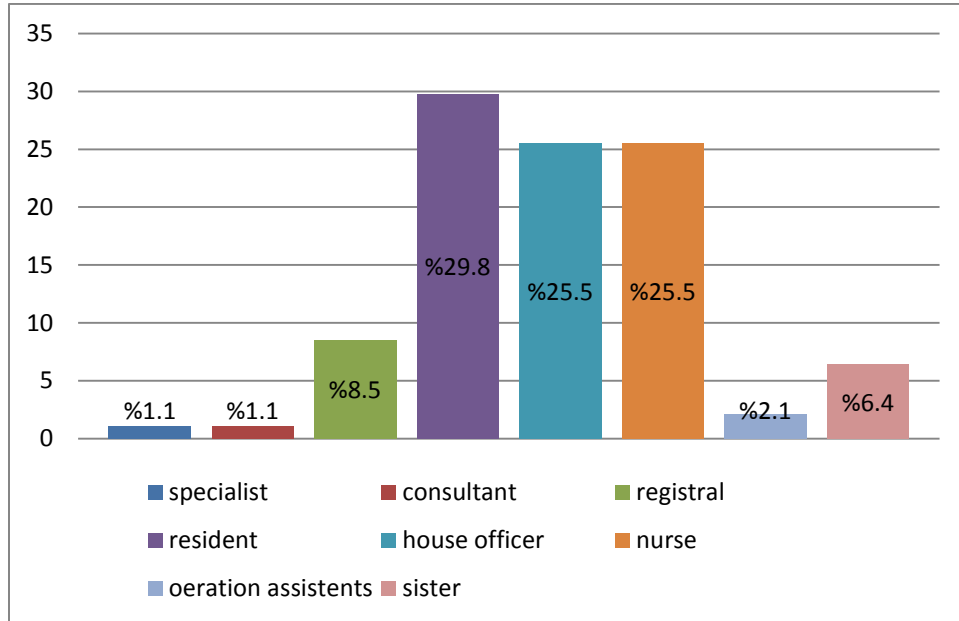


n=188

Service period of most of them between 3 month up to 1 year (38.3%).

Figure 3 Types of HCPs

at NRTH in Nov. 2016

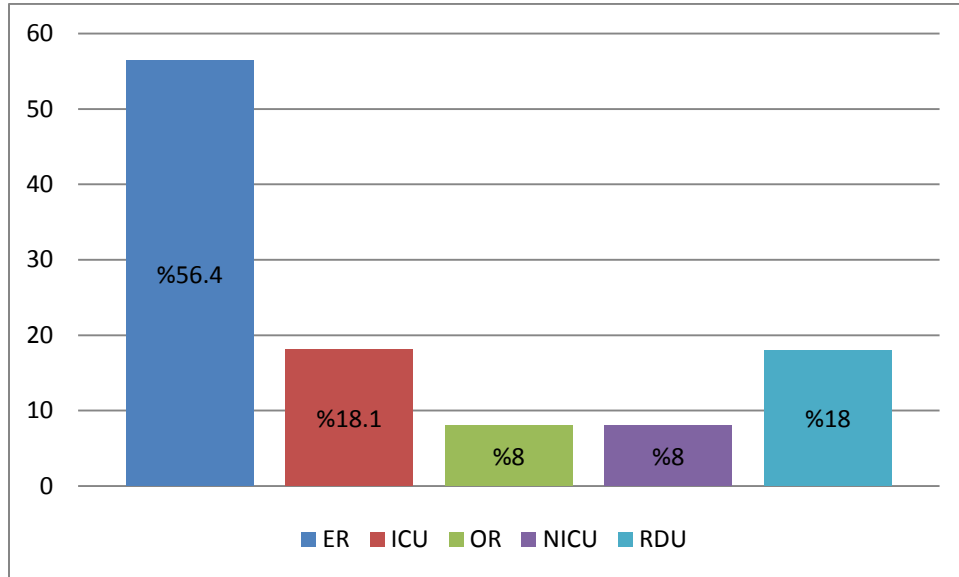


n=188

Most of the participants were residents (29.8%).

Figure 4 HCPs distribution in department

at NRTH in Nov. 2016

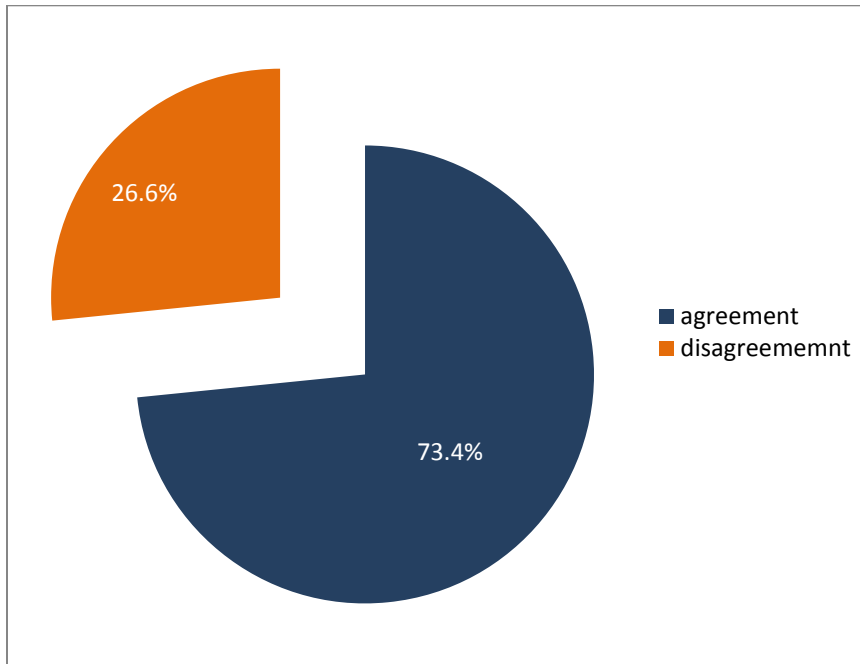


n=188

Most of participants from emergency department (56.4%)

Figure 5 HCPs agreement about effectiveness of respiratory hygiene and cough etiquette

at NRTH in Nov. 2016

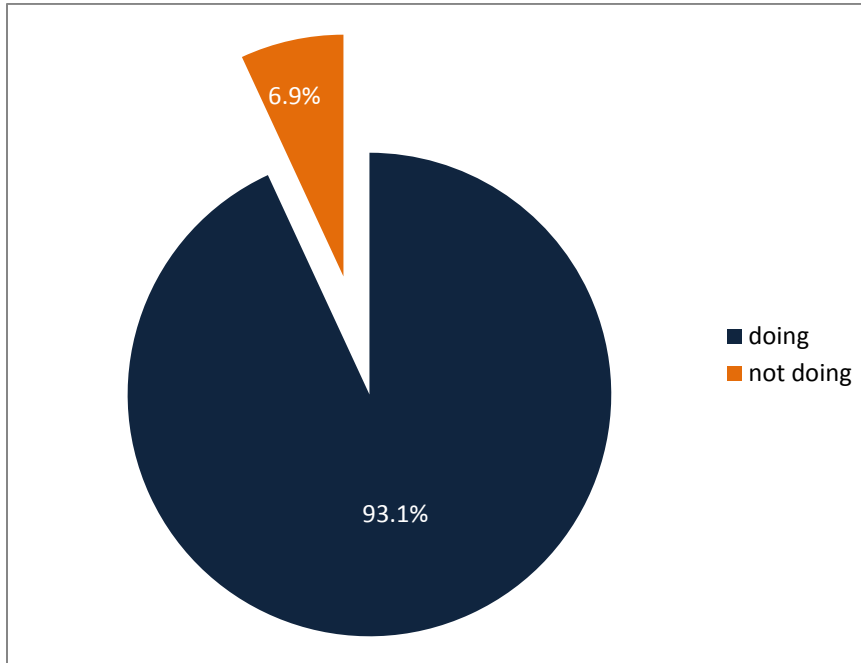


n=188

Agreement was about (73.4 %)

Figure 6 HCPs doing HH after gloves removal

at NRTH in Nov. 2016

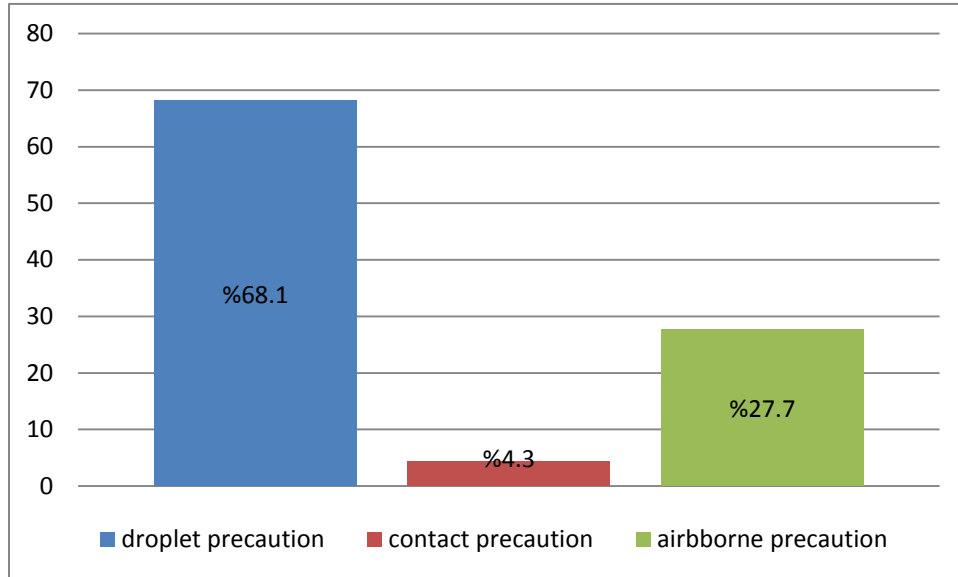


n=188

(93,1%) from health providers were clean/disinfect hands after removing gloves.

Figure 7 HCPs knowledge about TB precaution type

at NRTH in Nov. 2016



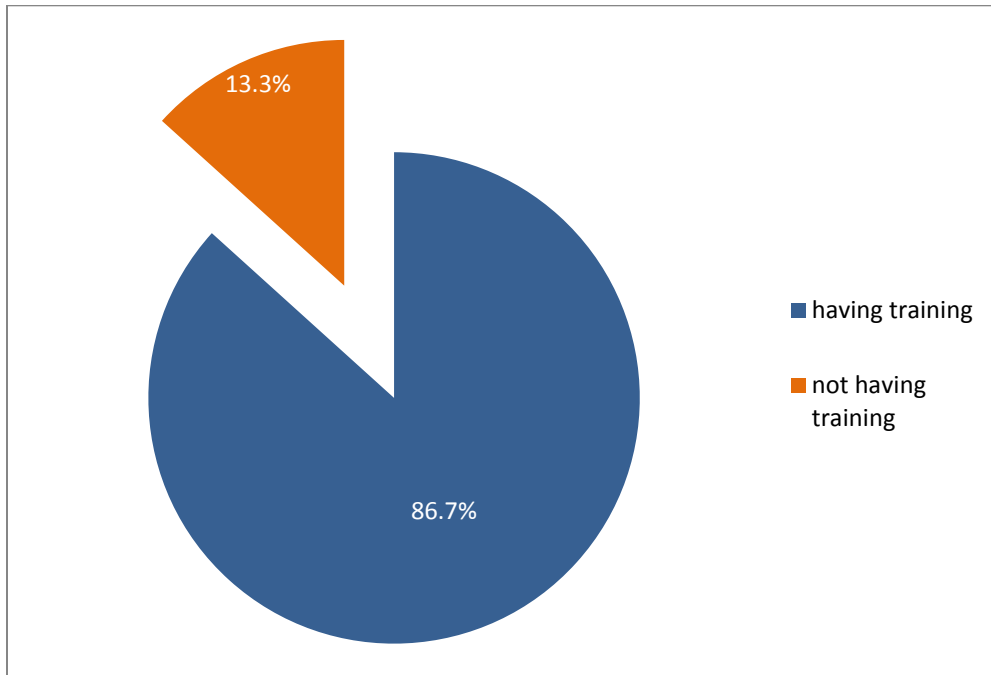
n=188

(68.1%) of health care providers think that TB precaution is a droplet

.

Figure 8 HCPs underwent training program on respiratory hygiene and cough etiquette

at NRTH in Nov. 2016

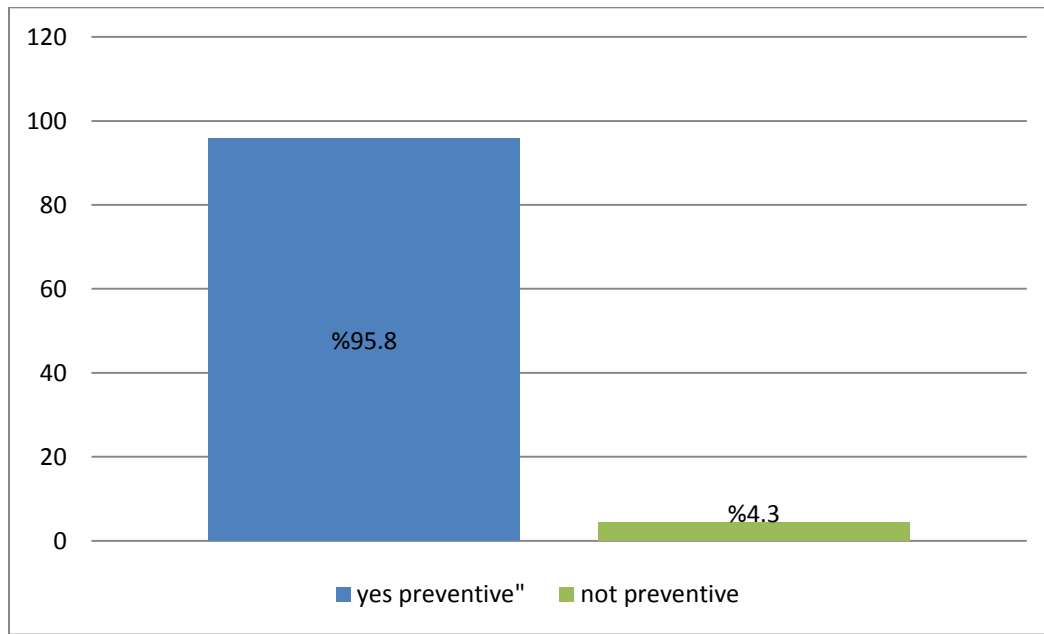


n=188

(86.7%) of health care providers not having training program upon work.

Figure 9-1 HCPs agreement in preventive role of respiratory hygiene and cough etiquette

at NRTH in Nov. 2016

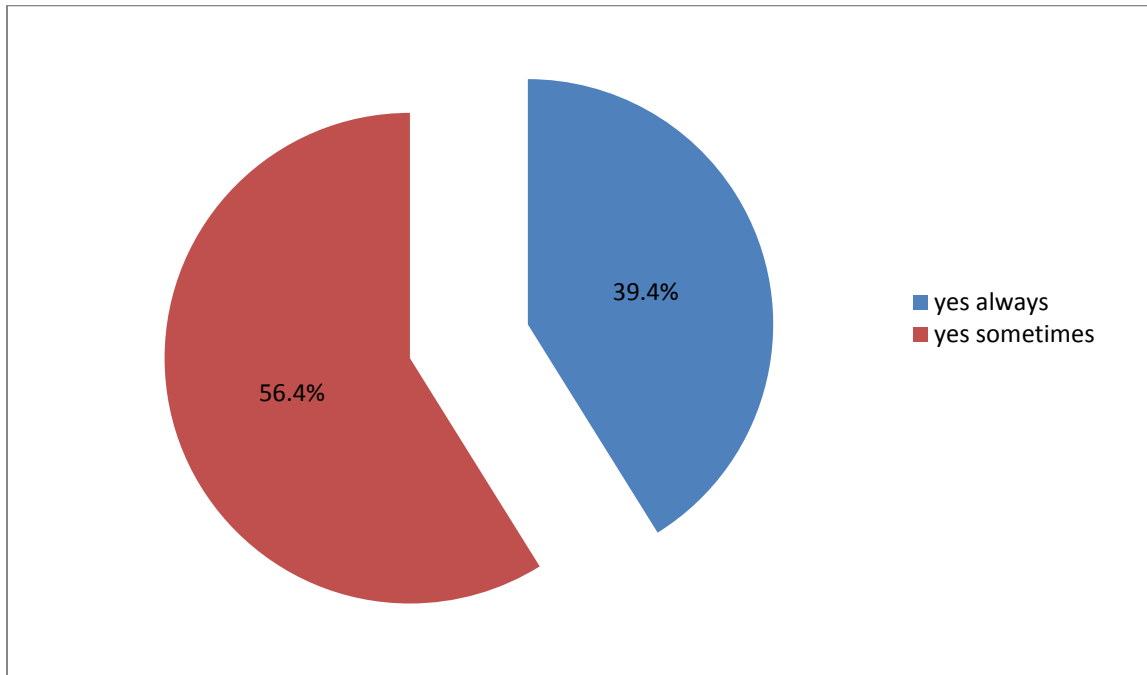


n=188

Most of health care providers agreed about the preventive role (95.8%).

Figure 9-2 If HCPs agreed about the preventive role of respiratory hygiene and cough etiquette

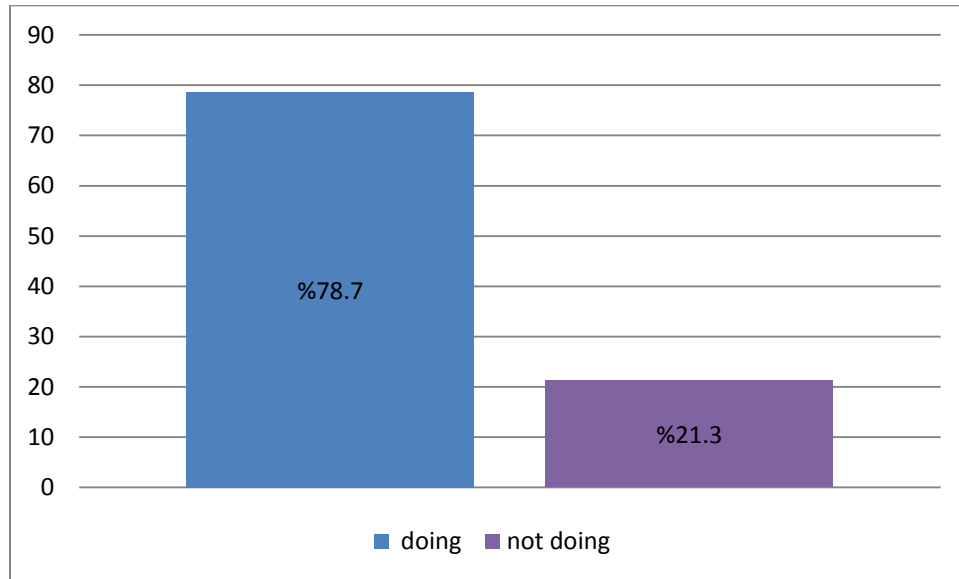
at NRTH in Nov. 2016



Only (39.4%) were agreed that respiratory hygiene/ cough etiquette is always preventive.

Figure 10-1 HCPs informing colleagues or teaching students about respiratory hygiene and cough etiquette

at NRTH in Nov. 2016

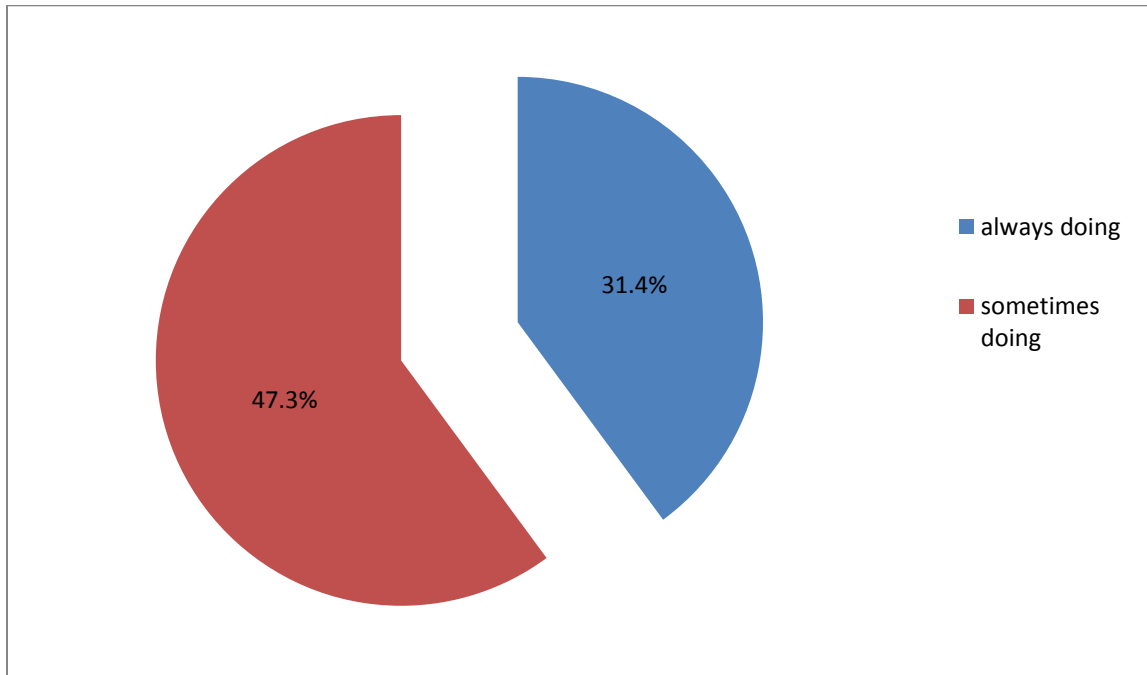


n=188

most of them doing (78.7%)

Figure 10-2 If HCPs informing colleagues or teaching students about respiratory hygiene and cough etiquette

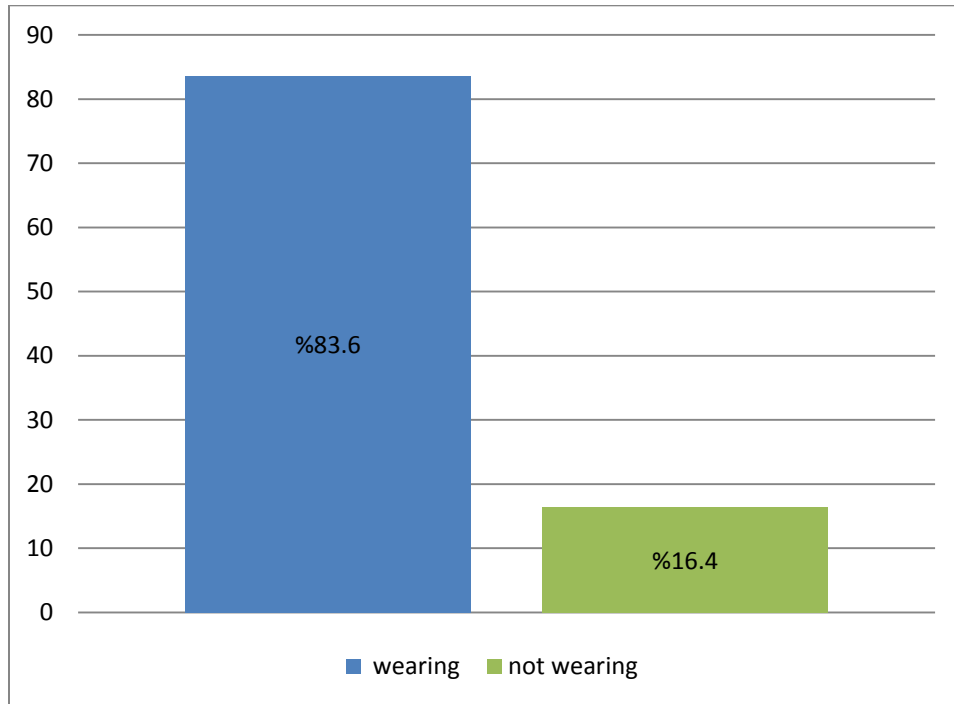
at NRTH in Nov. 2016



Only (31.4%) from HCPs were always informing their colleagues or teaching students about respiratory hygiene and cough etiquette

Figure 11-1 HCPs wearing surgical masks when dealing with patients having respiratory complaints

at NRTH in Nov. 2016

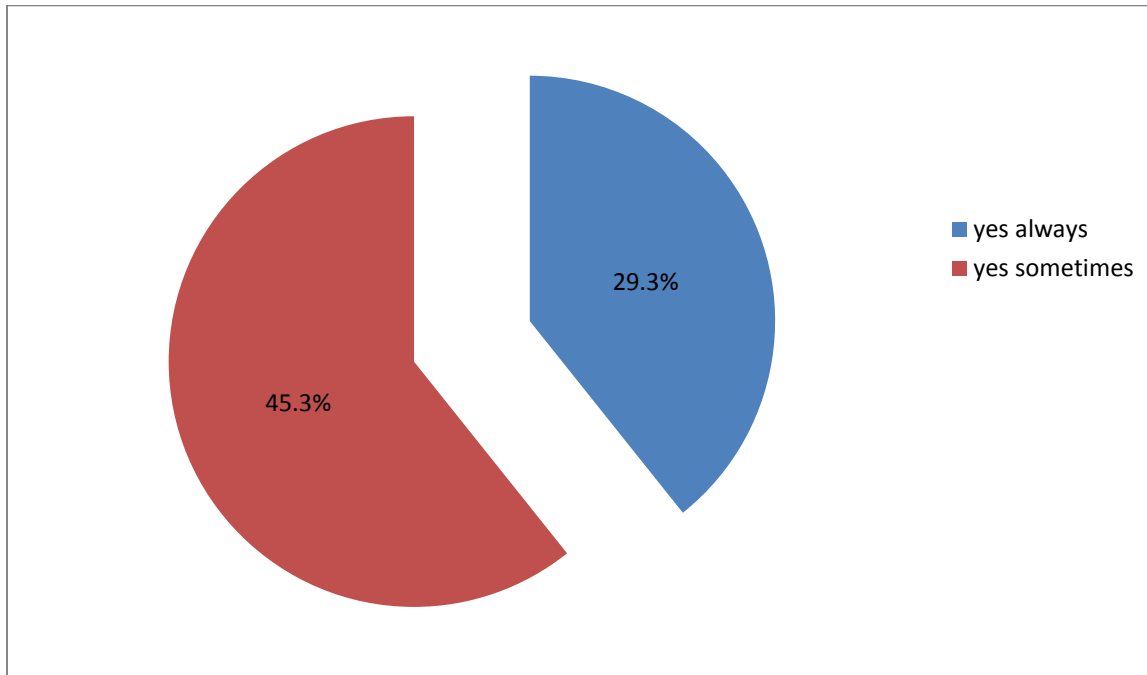


n=188

(83.6%) from HCPs were wearing surgical mask.

Figure 11-2 If HCPs wearing surgical masks when dealing with patients having respiratory complaints

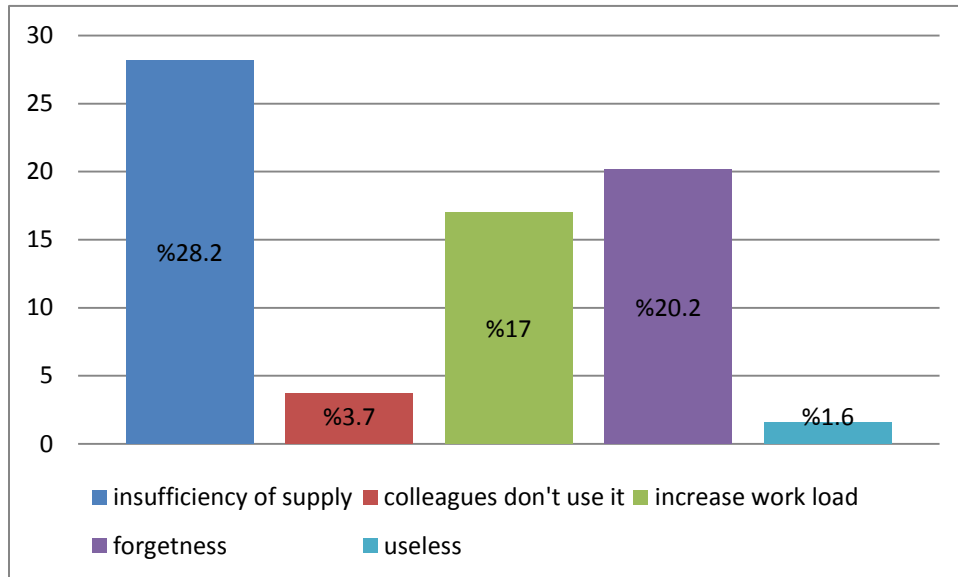
at NRTH in Nov. 2016



Only (29.3%) of HCPs were wearing surgical mask always.

Figure12 HCPs difficulties in the usage of surgical mask

at NRTH in Nov. 2016

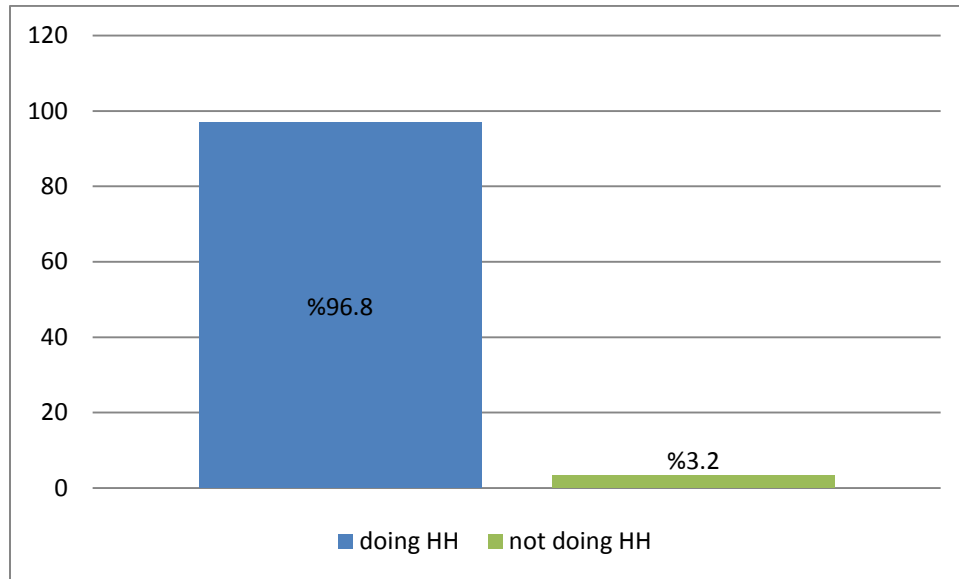


n=188

Most of HCPs were not using surgical mask due to insufficient supply (28.2%) then they forget to use it (20.2%).

Figure 13-1 HCPs practicing hand hygiene after gloves removal

at NRTH in Nov. 2016

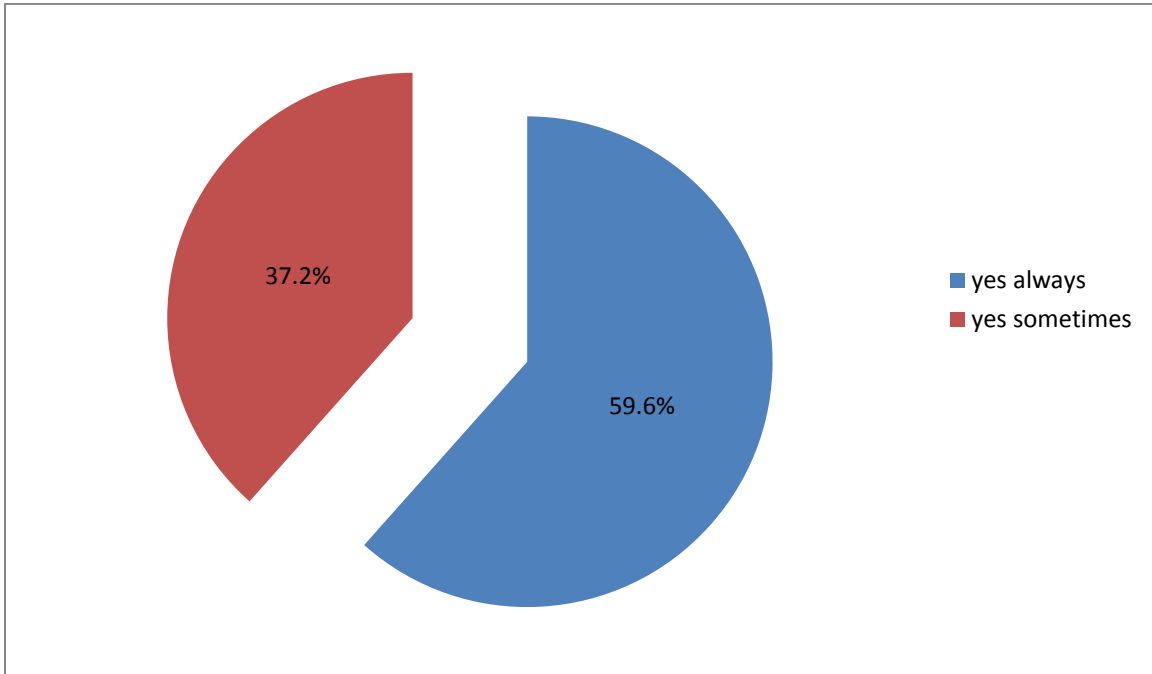


n=188

(96.8%) of HCPs were practicing HH after taking of gloves.

Figure 13-2 If HCPs practicing hand hygiene after gloves removal

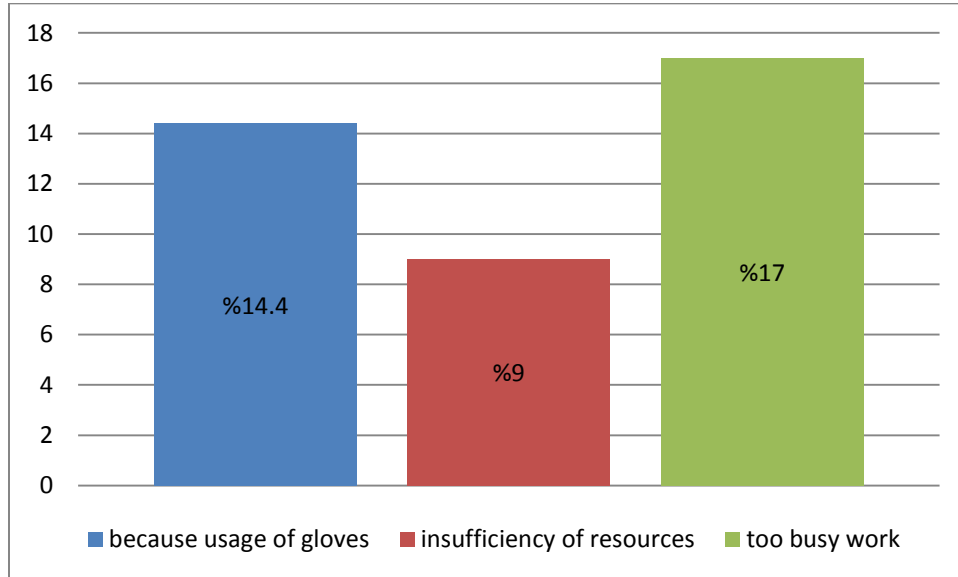
at NRTH in Nov. 2016



(59.6%) from HCPs doing HH after gloves removal.

Figure 13-3 Causes of not doing hand hygiene after gloves removal

at NRTH in Nov. 2016

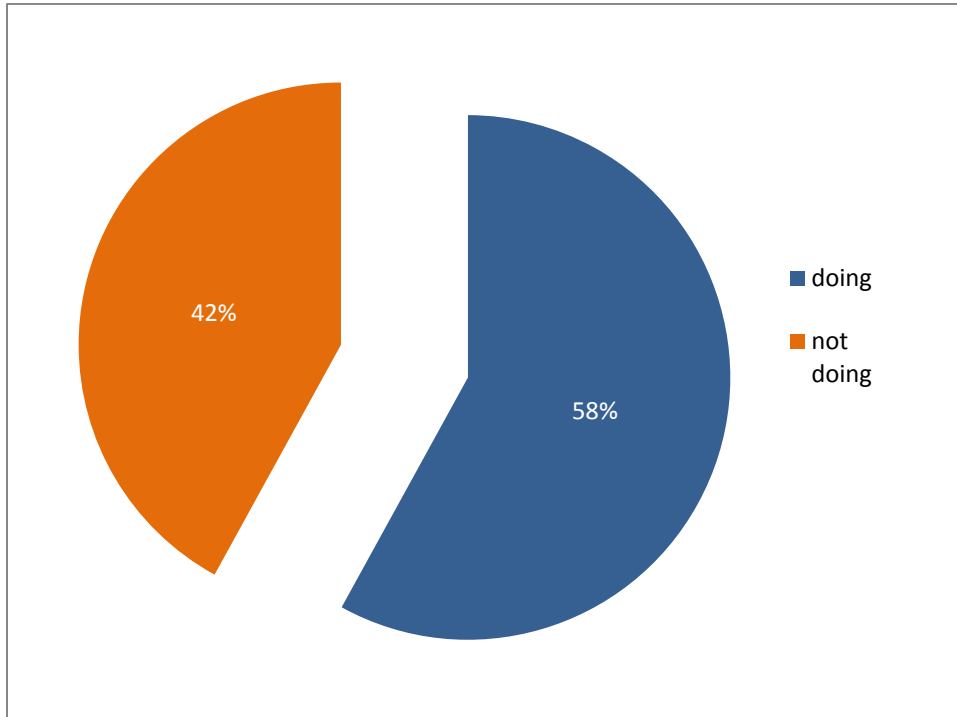


n=188

Most of them were too busy to do hand hygiene (17%).

Figure 14 Role of HCPs in patients counseling

at NRTH in Nov. 2016

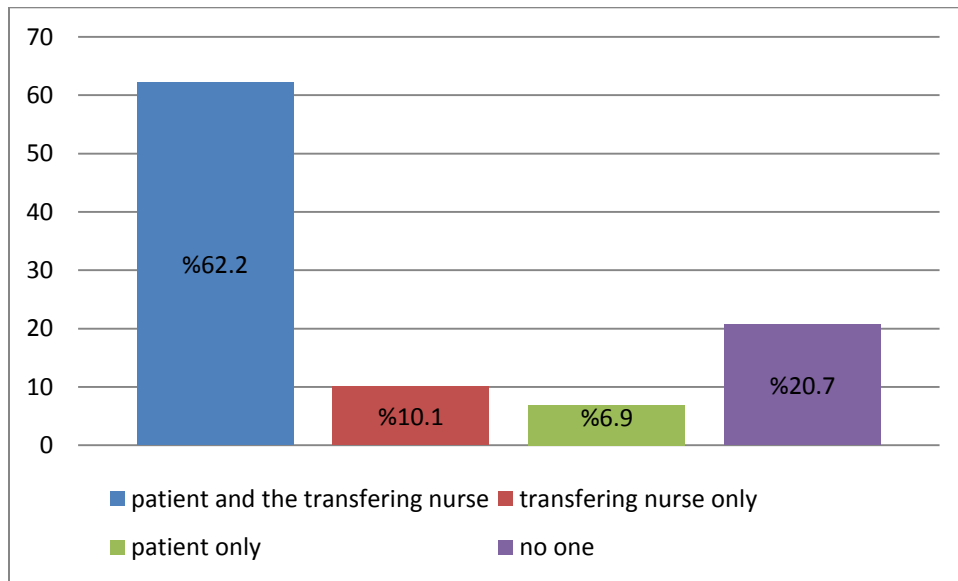


n=188

(58%) of HCPs are advising their patients.

Figure 15 usage of surgical masks during transference of patients in hospital departments

at NRTH in Nov. 2016

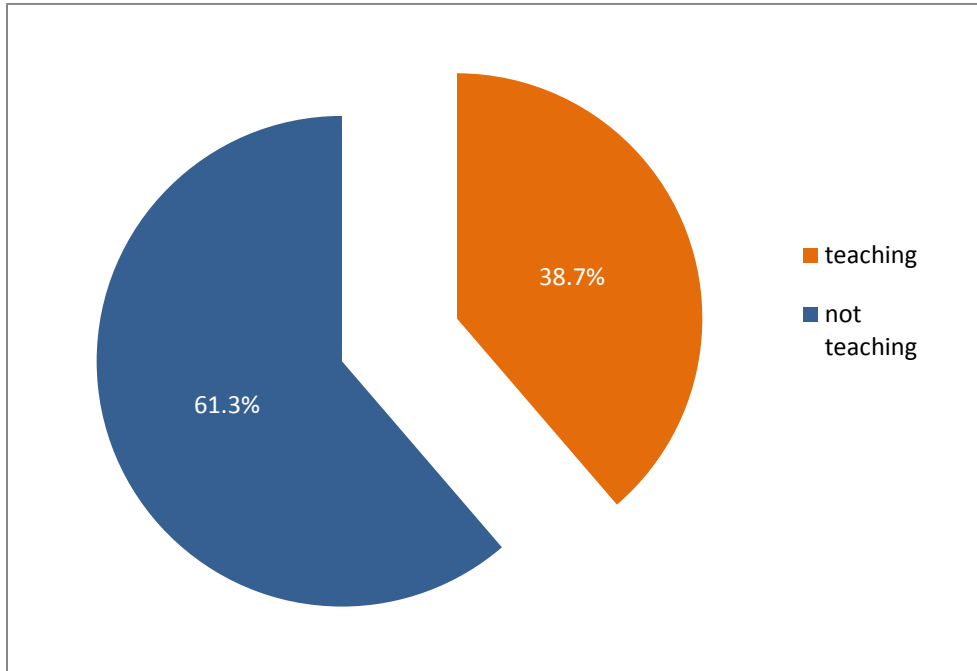


n=188

(62.2%) masking both patient and transferring nurse and only (20.7%) said no one putting the mask.

Figure 16 Role of HCPs in visitor's education

at NRTH in Nov. 2016

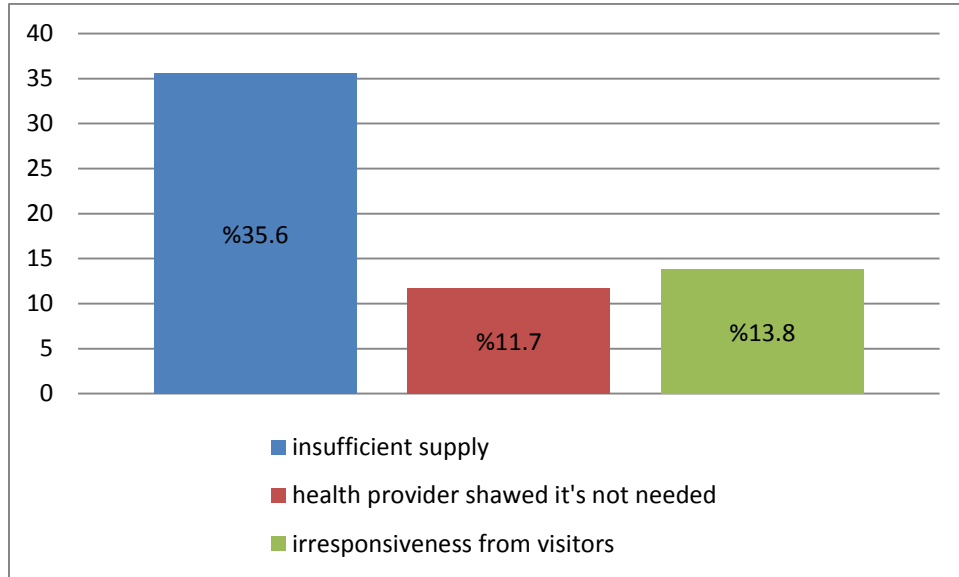


n=188

(61.2%) of HCPs were not educating.

Figure 17 Difficulties that facing HCPs in masking visitors

at NRTH in Nov. 2016

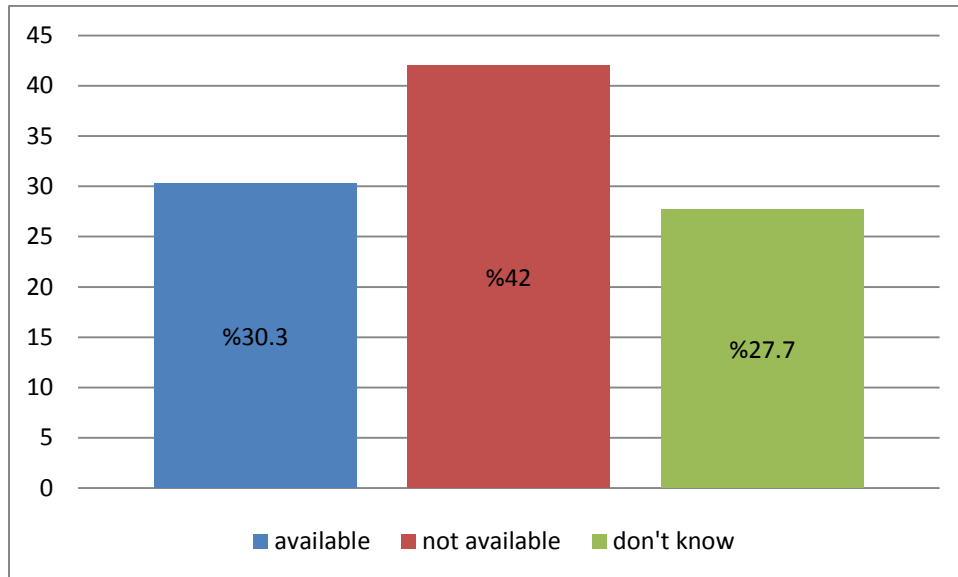


n=188

Insufficient supply (35.6%).

Figure 18 Availability of written policies and procedure

at NRTH in Nov. 2016



n=188

(42%) of HPs said there's no written policies and procedures in their department.

Table 1 : usage of gloves during contact with patient having respiratory secretion in relation to their service period

at NRTH in Nov. 2016

| | Service period | | | | |
|-------------------------------------------------------------------------|--------------------------|-------------------------------------|------------------------------------|-------------------------|--------------|
| Usage of gloves after contact with patient respiratory secretion | Less than 3 month | 3 month and less than 1 year | 1 year to less than 3 years | 3 years and more | Total |
| Yes | 31 | 70 | 49 | 4 | 177 |
| No | 6 | 2 | 1 | 2 | 11 |
| Total | 37 | 72 | 50 | 29 | 188 |

Table 2: wearing of surgical mask when dealing with patients having cough or sneezing in relation to service period of HCPs

at NRTH in Nov. 2016

| | Service period | | | | Total |
|-----------------------------------------------------------------------------------------------------|-------------------|------------------------------|-----------------------------|------------------|-------|
| | Less than 3 month | 3 month and less than 1 year | 1 year to less than 3 years | 3 years and more | |
| Wearing of surgical mask by health providers when dealing with patients of cough or sneezing | | | | | |
| Yes | 25 | 62 | 44 | 26 | 157 |
| No | 12 | 10 | 6 | 3 | 31 |
| Total | 37 | 72 | 50 | 29 | 188 |

Table 3: Wearing of surgical mask when dealing with coughing patients or sneezing in relation to the type of HCPs

at NRTH in Nov. 2016

| Type of HCP | HPs wearing surgical mask when dealing with patients of cough or sneezing | | Total |
|----------------------------|----------------------------------------------------------------------------------|-----------|--------------|
| | yes always | No | |
| Specialist | 1 | 1 | 2 |
| Consultant | 2 | 0 | 2 |
| Registrar | 13 | 3 | 16 |
| Resident | 47 | 9 | 56 |
| house officer | 36 | 12 | 48 |
| Nurse | 46 | 2 | 48 |
| operation assistant | 1 | 3 | 4 |
| Sister | 11 | 1 | 12 |
| Total | 157 | 31 | 188 |

Table 4: type of hand hygiene used by HCPs after touching patient respiratory secretions per hospital department

at NRTH in Nov. 2016

| Department | Type of HH after touching patient respiratory secretions | | | Total |
|-------------------|-----------------------------------------------------------------|-------------------------|-----------------------|--------------|
| | Alcohol only | alcohol hand rub | Soap and water | |
| ER | 36 | 34 | 36 | 106 |
| ICU | 21 | 4 | 9 | 34 |
| OR | 3 | 2 | 10 | 15 |
| NICU | 3 | 6 | 6 | 15 |
| RDU | 7 | 4 | 7 | 18 |
| Total | 70 | 50 | 68 | 188 |

Chi square : 19.331 p value : 0.13

There was no significant relationship between the type of hand hygiene used by health providers and their department of work.

Table 5: Relation between type of HCP and giving a co-patient or visitors surgical mask in patient room

at NRTH in Nov. 2016

| | giving the co-patient or the visitors surgical mask when they are in patient room | | |
|----------------------------|------------------------------------------------------------------------------------------|-------------------|--------------|
| Type of HCP | Giving | Not giving | Total |
| Specialist | 1 | 1 | 2 |
| Consultant | 1 | 1 | 2 |
| Registrar | 7 | 9 | 16 |
| Resident | 13 | 43 | 56 |
| house officer | 17 | 31 | 48 |
| Nurse | 25 | 23 | 48 |
| Operation assistant | 1 | 3 | 4 |
| Sister | 8 | 4 | 12 |
| Total | 73 | 115 | 188 |

Chi square: 14,144 p value: 0.49

There was no significant relationship.

Table 6: Counseling patients and visitors about respiratory hygiene and cough etiquette in relation to the type of HCPs

at NRTH in Nov. 2016

| Type of HCPs | Health care providers counseling patient and visitors | | Total |
|---------------------|-------------------------------------------------------|-----------|------------|
| | Doing | Not doing | |
| Specialist | 1 | 1 | 2 |
| Consultant | 2 | 0 | 2 |
| Registrar | 15 | 1 | 16 |
| Resident | 34 | 22 | 56 |
| house officer | 35 | 13 | 48 |
| Nurse | 44 | 4 | 48 |
| operation assistant | 2 | 2 | 4 |
| Sister | 10 | 2 | 12 |
| Total | 143 | 45 | 188 |

Chi square: 1.891 p value: 0.006

There was a significant relationship between the patient counseling and type of health care provider who did it.

Observation Result

Table no 7: Compliance / noncompliance rate of HCPs practice

at NRTH in Nov. 2016

| NO. | Task | Compliance rate | Non-compliance rate |
|------------|---------------------------------------------------------------------------------------|------------------------|----------------------------|
| 1 | HCW wearing of surgical mask | 33.7% | 66.3% |
| 2 | Wash hands before patient contact | 5% | 95% |
| 3 | Wash hands after patient contact | 52.5% | 47.5% |
| 4 | Wearing HCWs of gloves | 83.7% | 16.3% |
| 5 | Inform patient of need to wear mask | 0% | 100% |
| 6 | Giving patient tissue to cover his mouth and nose | 0% | 100% |
| 7 | Appropriately isolate patient | 77.5% | 22.5% |
| 8 | Inform patient of need to wash hands after contact with respiratory secretions | 33.7% | 66.3% |
| 9 | Total | 35.8% | 64.2% |

n=80

Focus group discussion result:

Out of 5 small groups selected randomly from departments of the study , the knowledge and practice varied among HPs, discussants emphasized the presence of barriers for the good practice of respiratory hygiene and cough etiquette were mainly shortage of water (sometimes) and antiseptic soaps, PPE also sometimes not available mostly surgical masks. Then several participants especially in ER and RDU verbalized that the time is a factor also reflected by high patient flow impact on their ability to remember the practice of respiratory hygiene and cough etiquette.

Chapter 5
Discussion
Conclusion
Recommendations

Discussion

This study conducted at National Ribat teaching hospital in Khartoum, Sudan in order to assess knowledge, attitude and practice of HCPs towards respiratory hygiene and cough etiquette. The study sample consisted of 188 health care providers, total number of opportunity observed were 80 observations. Also 5 small focus group was done in which the affected factors was elicited. Collected data were performed during the day shift (80%) and evening shift (20%). Most of respondents in all departments were females (70.2%), it's same to study done in Canada in which female was the majority (65.35%). Most of our study respondents were from ER (56.4%).

This study describes the Compliance rate (%) of respiratory hygiene and cough etiquette practice was only (35.8 %).

General knowledge of HCPs was adequate (57.25%) except in question of the type of TB precaution, majority of HCPs answered it with droplet (68.1%). On the other hands their practice was inadequate although their knowledge scores. The fact that only 33.7 % of the HCPs were practicing surgical mask when dealing with complaining respiratory symptoms patient that suggested the knowledge of respiratory precaution in the usage of surgical mask and clean glove when dealing with expectorant coughing patient is incomplete (60.6%). Cough droplets are centerpiece in the chain of transmission process because infected person will expels numerous droplets of different sizes into air every time they cough. (10)

Although HCPs between the ages 20-29 years (72.2%) were supposed to be more likely to have high knowledge of respiratory hygiene and cough etiquette compares to the more aged group. Maybe this issue determined by less training programs in

the hospital and it confirmed by only (13.3%) of HCs were receiving programs upon work.

As clear the commonest HCs believe that those respiratory hygiene and cough etiquette are sometimes effective (56.4%) and can be considered as a precaution from respiratory illness, and that of (54.3%) of HCs said they are wearing surgical masks only sometimes and their causes of that mostly due to insufficient supply (28.2%), and that of (37.3%) of HCs sometimes inform their colleagues or teaching their students about these precautions.

In this study, there is no statistically significant in the type of hand hygiene used after touching patient respiratory secretions per hospital department. But we showed that there is a significant relationship between HCs wearing surgical mask when dealing with patients coughing or sneezing and type of HCs.

(33.7 %) from HCs were wearing surgical masks, most of them were resident doctors who wearing it always (16.4 %) and (30.4%) sometimes. It's may be due to their on-the-job experience not to their training. In addition female are likely to be more adherent to respiratory hygiene than male, its might be due to natural tendencies of extra caution against infections. In comparison with the study done in Canada that assessed respiratory hygiene in emergency department described the reason of not wearing surgical mask was tendency to forget (37.8%) and discomfort (35.1%).

Regarding general observation, in emergency rooms, both cold cases section and emergency section were included. Running water and wide sink at the entrance of emergency section with bar soap, one sink and running water in doctor's room, one sink in nursing room, one sink in dressing room and one sink in two intermediate rooms. Each had waste collection containers for sharps and plastic containers for other medical waste located near to work area.

In cold cases area, there is 4 rooms; pediatrics, orthopedics, surgery and medicine. There was small sinks and running water in each with bar soap and plastic waste containers and a lot of medical waste (syringes, cotton with blood) were found in the floor despite of waste containers placement.

From all observed rooms in ICU, 2 rooms each had 8 beds separated with shields only. There was wide sink and running water at the entrance of both rooms with liquid soap and antiseptic bottles were placed in the nursing station. Also waste collection containers for sharps and plastic one for other medical waste placed near to work place.

Then regarding renal dialysis unit, had two rooms one had 8 beds and the other room had 11 beds with no in-between separation at all. Had far sink and running water from work place and near waste collection bags. No antiseptics in both rooms.

In nursery intensive care unit there were 3 rooms each had 4-5 beds, sink and running water with bar soap and waste containers for sharps and one plastic bag in each. Had alcohol solution bottle in each room.

On the other hands, Operation room has 5 rooms, wide sink at the entrance for scrubbing with running water and antiseptic solution were available. Waste collection containers were in each room.

The ventilation system in ICU, NICU, RDU and OR is central air conditioning. No specific ventilation system in all hospital as well as no isolation rooms (HEPA filters or negative air pressure were not available). In cold cases area in emergency department had unworked AC and they tend to open windows except in orthopedics clinic.

From all observed departments in hospital there were no written guidelines, policies and no posters about risk communication of respiratory hygiene and cough etiquette.

Practice in this study was assessed by using (self-reporting checklist) and the result might be differ from the real level of practice probably because HCP can overestimate the extent to comply with our respiratory precautions practice and it gives us a bias. We identifying the most two prevailing respiratory hygiene related risk practice in hospital. HCPs were not giving or informing patients about the need to cover or masking their nose and mouth at coughing or sneezing, during the whole observation period it's not done at all (100%) .It's reflecting the lack of knowledge regarding increase transmission risk. As well as no patients had applied the mask recommendations during their transportation inside hospital in any department perhaps the questionnaire analysis showed that (62.2%) masking both patients and transporting nurse.

Also we observed the worst score was only (5%) from HCPs were doing hand hygiene before contact to the patient but (52.5%) from them did hand hygiene after patient contact. Hand hygiene score after patient contact similar to that done in research conducted in Canada that gives (53%) score and gives a higher score than this study (but still low) in hand hygiene before contacting patient (40%).

In this study score considered low ant it may be due to less training programs on hand hygiene. On the other hands (83.7%) from HCPs were wearied gloves when dealing with patients having respiratory complaints and secretions but only (36.2%) from them were washed their hands with water and soap after removing gloves and it's differ from study done among students nurses in Philippines which showed HCPs washed their hands after taking off their gloves always by (56.9%). In this study some of HCPs have a strong believe that using gloves is considered as protection and no need to do HH after removing it, therefore they need a small workshops stressing on this issue.

Also in this study there is a good score in isolation of patients at triage area in ER by (77.5%) and in comparison to study done at two university hospital in Canada for triaging nurses, they found only (12%) good isolation practice .

Conclusion

- Compliance rate was 35.8% which is low and non-compliance rate was 64.2% in which several barriers were explored as the reasons of non-compliance but the most was shortage of PPE mostly in surgical mask and washing soaps.
- Knowledge of HCPs was 57.25% . Clear miss-matching with the knowledge and actual practice among health providers was obvious.
- Only 5% of HCPs wash hands before patient contact and 52.2% were wash their hands after patient contact
- No HCP were informing patient about the need to wear surgical mask 100% or giving patient tissue to cover his/her mouth and nose during cough or sneezing 100%.
- 61.2% of HCPs are not counseling patients and their visitors.
- There are no published policies and procedures about the respiratory hygiene and cough etiquette in the hospital.
- Insuffient supply of PPE as in surgical mask by 28.2%.
- 86.7% of HCPs not having training program upon work.

Recommendations

- 1.** Avail the required equipment's that facilitates implementation of respiratory hygiene and cough etiquette.
- 2.** Activate policies and procedures in all hospital departments and implement training programs to all HPs.
- 3.** Merge visual signs and posters in appropriate language of served population in hospital waiting areas as well as departments and instruct patients and HPs to practice respiratory hygiene and cough etiquette.
- 4.** Implement training programs to HPs about respiratory precautions and hand hygiene.
- 5.** Stay adherent to respiratory precaution whenever needed.
- 6.** Educate patients and their visitors about the need of masking and covering face and nose and also about hand hygiene.
- 7.** Doing future researches to evaluate the situation after implementing the above and for continuous improvement.

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| | | | | | |
|----------|--------------------|------------------------------|-----------------------------|---------------------------|-------------------|
| 1 | Age | 20-29 years | 30-39 years | 39-40 years | 40 years and more |
| 2 | Service job | 1 month to less than 3 month | 3 month to less than 1 year | 1 year to less than years | 3 years and more |

| | | | |
|----------|---------------|--------|------|
| 3 | Gender | Female | Male |
|----------|---------------|--------|------|

| | | | | | | | |
|----------|---------------------|------------|------------|----------|--------|-------|--------------|
| 4 | professional | Consultant | Specialist | Resident | Intern | Nurse | OR assistant |
| 5 | Department | ER | ICU | NICU | RDU | OR | |

| | | | |
|----------|-----------------------------------------------------------------------------|-----|----|
| 6 | Do you know about respiratory hygiene and cough etiquette | Yes | No |
| 7 | Do you think it's' effective in prevention of respiratory illnesses | Yes | No |
| 8 | Do you need to clean or disinfect your hands after taking off gloves | Yes | No |

| | | | | |
|----------|-------------------------------|---------------------|---------------------|----------------------|
| 9 | TB type of precautions | Droplet precautions | Contact precautions | Airborne precautions |
|----------|-------------------------------|---------------------|---------------------|----------------------|

| | | | |
|-----------|--------------------------------------------------------------------------------------------|-----|----|
| 10 | Are you believe in the prevention role of respiratory precaution | Yes | No |
| 11 | Do you told or teach your colleagues and students about the respiratory precautions | Yes | No |

| | | | |
|-------------|-------------------------------------------------------------------------------------------------|------------|---------------|
| 12 | Are you wearing surgical mask when you're dealing with patients having cough or sneezing | Yes | No |
| 13-1 | How frequent you wear surgical mask | Yes always | Yes sometimes |

| | | | | | | |
|-------------|--------------------------------------|----------------------------|-----------------------------|-------------------------|----------|-----------------|
| 13-2 | If you don't wear masks, why? | Too busy to use useless | My colleague don't use them | insufficiency of supply | I forget | feel discomfort |
|-------------|--------------------------------------|----------------------------|-----------------------------|-------------------------|----------|-----------------|

| | | | | | | |
|-------------|---------------------------------------------------------------------------------------|-----------------|--------------------------|-------------------------|---------------|-----------------|
| 14 | Are you using gloves during contact with patient having respiratory secretions | Yes | | | No | |
| 14-1 | How frequent you use gloves | Yes always | | | Yes sometimes | |
| 14-2 | If you don't use gloves, why? | Too busy to use | colleague don't use them | insufficiency of supply | I forget | feel discomfort |

| | | | | | | |
|-------------|---------------------------------------------------------|----------------------------|---------------------|----------------------------------|----|--|
| 15 | Are you doing hand hygiene after removing gloves | Yes | | | No | |
| 15-1 | If you don't do hand hygiene, why | Because I'm wearing gloves | Insufficient supply | No time because of too much work | | |

| | | | | | | |
|-------------|-----------------------------------------------------------------------------|---------|-------------------|----------|--------------|--|
| 16-1 | Do you give or advice to give a surgical mask to patients with cough | Yes | | | No | |
| 16-2 | If no, why | No need | Insuffient supply | I forget | To busy work | |

| | | | | | | |
|-----------|-------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------|--------------|--------|--|
| 17 | During transporting patient from department to other e.g. to X Ray department who is wearing surgical mask | Transport nurse | Patient and transport nurse | Patient only | No one | |
|-----------|-------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------|--------------|--------|--|

| | | | | |
|-------------|------------------------------------------------------------------------------|---------------------|---------|------------------------|
| 18-1 | Do you give or advice to give relative of the patient a surgical mask | Yes | No | |
| 18-2 | If no, why | Insufficient supply | No need | irresponsive relatives |

| | | | | |
|-----------|-----------------------------------------------------------------------------------------------------|-----|----|--------------|
| 19 | Are you teaching patient and their relatives about respiratory hygiene and cough etiquette | yes | No | |
| 20 | Is there a posted signs of respiratory hygiene and cough etiquette | yes | No | |
| 21 | Do you have written policies and procedure regarding respiratory hygiene and cough etiquette | yes | No | I don't know |

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Observational checklist prepared to study knowledge, attitude and practice (KAP) of health care providers towards respiratory hygiene and cough etiquette

Structural observational checklist:

| No. | Item | Present | Not present |
|-----------|------------------------------------------------------------------------------|---------|-------------|
| | Hand hygiene resource | | |
| 1 | Running clean water | | |
| 2 | Near water supply to the work | | |
| 3 | Wide sink | | |
| 4 | clean sinks | | |
| 5 | Elbow closed faucet | | |
| 6 | Aseptic soap | | |
| 7 | Alcohol based hand rub bottles | | |
| 8 | Clean single use towel | | |
| 9 | Availability of surgical mask | | |
| 10 | Availability of clean gloves | | |
| 11 | Availability of clean tissues | | |
| 12 | Availability of waste disposal product | | |
| 13 | Near to work place waste disposal product | | |
| 14 | Ventilation system | | |
| 15 | If yes mention the type of ventilation system: | | |
| 16 | Spatial separated rooms or cubicles for symptomatic respiratory ill patient | | |
| 17 | Clean cubicle or patient room | | |
| 18 | Visual alerts instructing the use of respiratory Hygiene and cough etiquette | | |
| 19 | Written policies and procedures in the department | | |
| 20 | Upon work and continuous training programs For HCWs (documented plan) | | |

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**Observation for health providers when dealing with patient having
cough, sneezing and respiratory secretions**

Task:

| No. | Item | missed | Done |
|------------|--------------------------------------------------------------------------------|---------------|-------------|
| 1 | HCW wearing of surgical mask | | |
| 2 | Wash hands before patient contact | | |
| 3 | Wash hands after patient contact | | |
| 4 | Wearing HCWs of gloves | | |
| 5 | Inform patient of need to wear mask | | |
| 6 | Giving patient tissue to cover his mouth and nose | | |
| 7 | Patient in separate cubicle | | |
| 8 | Inform patient of need to wash hands after contact with respiratory secretions | | |
| 9 | Is HCW wear glove | | |
| 10 | Good ventilation system | | |
| 11 | If yes mention type of ventilation system | | |
| 12 | HCW making hand hygiene | | |
| 13 | If yes mention type of HH done | | |
| 14 | Proper wasting of used objects | | |

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Focus group discussion questions

- 1- Do you know about respiratory hygiene and cough etiquette
- 2- What's the elements of respiratory hygiene and cough etiquette
- 3- How you deal with respiratory illness patients
- 4- What's PPE should be used for every symptomatic respiratory patient
- 5- When you masking patients
- 6- Do you have continuous supply of PPE in your department
- 7- Do you remind your colleagues or advising patients and visitors about respiratory precautions
- 8- What's the most difficulties that facing you and preventing the proper implementation of respiratory hygiene and cough etiquette.
- 9- How do you dispose the used PPE