

**KNOWLEDGE, PERCEPTION AND USE OF HANDKERCHIEF AS A
FOMITE AMONG PUBLIC HEALTH STUDENTS IN
UNIVERSITY OF IBADAN**

BY

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DEDICATION

This work is dedicated to The Almighty and only God

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ABSTRACT

Evidence has shown that handkerchief which is an example of a fomite can serve as an incubator for pathogens and also serve as a vehicle for the transmission of infectious diseases if not handled properly. Despite the dangers associated with improper use of handkerchief, very few studies exist on the topic. This study, therefore, examined the knowledge, perception and use of handkerchief as a fomite among Public Health students in the University of Ibadan, Oyo State.

A descriptive cross-sectional study was conducted among 390 Public Health students in University of Ibadan using a two-stage sampling technique involving proportionate and simple random techniques. A semi-structured self-administered questionnaire was used for data collection. The instrument included 18-point knowledge (scores of 0-12 and >12 were classified as poor and good knowledge of use of handkerchief, respectively), 20-point perception (scores of 0-17 and >17 were categorised as poor and good perception of handkerchief as a fomite, respectively) and 12-point perceived health importance (scores of 0-10 and >10 were categorised as poor and good perceived health importance, respectively). Data were analysed using descriptive and Chi-square test at $p=0.05$ level of significance.

Respondents' age was 27.5 ± 4.3 years and majority (62.3%) were females. Majority (85.9%) of the respondents used handkerchief and 62.3% had their handkerchiefs with them at the time of data collection. Respondents with poor and good knowledge of use of handkerchief were 51.3% and 48.7%, respectively. Majority (85.6%) of the respondents agreed that the standard colour for handkerchief should be white. Majority (80.0%) reported that handkerchiefs should be washed separately from other fabrics in order to prevent contamination. Respondents with poor and good perception of handkerchiefs as a fomite were 36.4% and 63.6%, respectively. Majority (92.6%) agreed that handkerchief could serve as a tool for the spread of infectious organisms and 70.5% agreed that once a handkerchief is contaminated there could be transfer of pathogenic organisms. Also, majority (92.3%) agreed that a handkerchief gets contaminated with infectious diseases when in contact with body fluid. Respondents with poor and good perception of health importance were 59.2% and 40.8%, respectively. Majority (80.0%) agreed that handkerchiefs have some health uses including prevention of spread of diseases like flu. There was a significant

association between sex and knowledge of use of handkerchief and between sex and perception of handkerchief as a fomite in the direction of the females.

Knowledge of use of handkerchief of the students was poor while perceptions of handkerchief as a fomite and health importance of handkerchief were high. Health education strategy such as awareness creation and enlightenment campaign on the proper use of handkerchief among students of the Faculty of Public Health, University of Ibadan are advocated.

Keywords: Handkerchief, Fomite, Pathogens, Perceived health importance, Infectious diseases.

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CERTIFICATION

I certify that this project was carried out by OMIRIN Olanrewaju Dayo in the Department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan, Ibadan, Nigeria.

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LIST OF ABBREVIATIONS

GI	-Gastrointestinal Illnesses
HAV	-Hepatitis A Virus
HBM	-Health Belief Model
HIV	-Human Immunodeficiency Virus
HPIV	-Human Parainfluenza Virus
ISFHH	-International Scientific Forum on Home Hygiene
KAP	-Knowledge, Attitude and Practice
MIDS	-Management of Infectious Disease in Schools
ND	-No Date
NGOs	-Non-Governmental Organisations
PFU	-Plaque forming Unit
PRD	-Positive Regulatory Domain
RI	-Respiratory Infection
RNA	-Ribonucleic Acid
RSV	- Respiratory syncytial virus
SA	- South Australia
SARS	- Severe Acute Respiratory Syndrome

SPSS - Statistical Package for Social Sciences

TB - Tuberculosis

UI - University of Ibadan

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The exact age of the handkerchief is difficult to determine. The earliest written evidence of the handkerchief comes from the Roman poet Catullus in the first century A.D. Most often called a sudarium, from sudor, to sweat, it was used to shield or veil the face and mouth and to wipe off sweat. In the first century B.C., it remained a luxury for the rich, due to the expensive nature of linen, which was then a prized import. By the first century A.D., when linen was more easily and cheaply imported, the middle and lower classes gained access to the handkerchief (Braun-Ronsdorf, 1967).

The use of handkerchief include drying hands after washing them, drying face after sweating or washing, drying (own/others') eyes after crying, preventing escape of infected droplets during sneezing or coughing, wiping mucus off the nose after sneezing or blowing the nose etc. Anyone with a few instructions in the childhood can learn these uses and then continue to apply them throughout life. They are simple and do not require too much intelligence or will power to remember and carry out. Handkerchiefs are usually carried in the pocket by males and sometimes by females whose dresses have pockets (Shashank, 2012). Usually females carry tiny handkerchiefs in their closed fists, rolled into balls. Some of them put them in their purses. Some women tuck it into their waistband created by tying the saree. Handkerchiefs are tied over the heads of children like scarves when the mother either cannot afford a scarf for her child, or when she does not wish to bother with the need to wash two separate garments when one can do the work of two. Since a scarf cannot be used like a handkerchief, most mothers prefer a handkerchief as a dual purpose object. Some persons remain in that stage of their psychological development forever, and continue to use a handkerchief for that purpose even in adult life. One can find such women riding on the back seats of two-wheelers, their hair kept in place with handkerchiefs tied over their heads, knots below their chins. It prevents the hair from getting disorganized, and also looks fashionable to some. Men with this sort of arrest of psychological development in the scarf-handkerchief confusion phase wear handkerchiefs like caps (Shashank, 2012)

Germs that cause respiratory infections (colds, influenza, strep throat) are found in saliva and nasal secretions. Sneezing and coughing spreads these germs through the air to other people. These germs can also be spread on contaminated hands or objects, such as handkerchiefs, because they can survive in the environment for hours to days. Contaminated textiles and fabrics are an excellent substrate for bacterial and fungal growth under the appropriate moisture and temperature conditions (Kramer, Schwebke and Kamp, 2006). Consumer concern for hygiene is particularly relevant during cold and flu season. When suffering from a cold, the ability to collect the germs in a tissue and dispose of them quickly may be a smart choice. On the other hand, handkerchiefs may help prevent illness by providing a more substantial barrier between an individual with a cold and those in close contact (Main and Emily, 2013).

Many students live in university residence-hall-type housing, and these settings can provide a venue that facilitates the spread of infection rapidly through the population. In residence housing, students may share a small room with one or more other students; have a shared bathroom; shared cafeterias; computer rooms and other shared places to socialize. These relatively closed and crowded living arrangements can facilitate the spread of infection from person to person (Sharp, Hyams & Watts, 1995). Common respiratory infections, including influenza and colds, have been shown to be associated with spending time in crowded environments like residence halls. Gastrointestinal infection outbreaks, including norovirus, have also been identified in student living settings (Moe, Christmas & Echols 2008). A student with a flu virus can just use a handkerchief and drop it carelessly on the bed or on the study table; another person may just come and handle the handkerchief. In the process, he gets infected. This can then lead to spread of the infection, due to the living environment and closeness of the student community. Therefore, cleaning and disinfecting areas where students live and socialize may be a key factor in preventing transmission on campus, especially for infections that are spread predominately by indirect-contact through fomites. The flow of air through residence halls may be another important aspect of infectious disease transmission on campuses. There is growing evidence that recycled air and low airflow may impact transmission of influenza and possibly other respiratory viruses. While there is limited research on the effect of airflow on transmission of infection in residence halls, there are a number of factors that may make airflow suboptimal in residence halls (Sun, Wang, Zhang & Sundell, 2001). Many residence halls on university campuses have windows that do not open or only open partially for safety reasons. The factors that are likely to impact air movement in a residence hall include: ventilation (natural or mechanical), individuals

moving about and opening and closing doors/windows or moving around other objects, heat generated from individuals and machines, and finally, students breathing, talking, coughing and sneezing (Tang, Noakes & Nielsen, 2007)..

1.2 Statement of Problem

Many people use handkerchief and they do not really know that improper handling and usage of it has serious health consequences. It has been shown that handkerchief which is an example of a fomite can serve as an incubator for pathogens and can also serve as a vehicle for the transmission of infectious diseases if not handled properly (Reynolds, Watts, Boone & Gerba, 2005). Some people put their handkerchief together with contaminated money in their pocket or purse, thereby causing a transmission of pathogen from the money to the handkerchief. And this same handkerchief is then used on them causing a transmission of infection from the handkerchief contaminated by the money to their body.

There is now growing evidence that contaminated fomites or surfaces play a key role in the spread of viral infections (Ansari, Springthorpe, Sattar, Rivard & Rahman, 1991). The evidence presented in the 2009 IFH review on the global burden of hygiene-related diseases shows that outbreaks of infections in the home and everyday life settings, particularly gastrointestinal (GI) infections, respiratory infections (RT), and skin, wound and eye infections, continue to exact a heavy burden on the health and prosperity of the global community and most of these are caused by fomites (Bloomfield, Exner, Signorelli, Kumar & Elizabeth, 2011).

Each year, there are 400 million cases of lower respiratory infections, which compared to upper respiratory illnesses, are more likely to lead to hospitalization and death (Monto, 2002). Worldwide annually there are 1.7 million deaths from diarrheal diseases and 1.5 million deaths from respiratory infections (Ustun and Covalan, 2006). Viruses cause an estimated 60% of human infections, and most common illnesses are produced by respiratory and enteric viruses (McElhaney, 2003) and contaminated fomites play a key role in the spread of these viral infections (Ansari et al, 1991)

Understanding transmission of respiratory illness (RI) and gastrointestinal illness (GI) disease spread, and how to prevent it, will aid reductions in burden. Annually, the average adult has about 2 to 4 acute upper respiratory illnesses. Children have approximately 6 to 8 (Heikkinen and Jrvinen, 2003). Rhinoviruses cause infections all year round, with one peak in the autumn,

usually as a result of children returning to school. Although colds are generally mild and self-limiting, they represent a significant economic burden due to loss in productivity and medical costs. Tuberculosis also possess a global burden most especially in developing countries where 75% of cases are within the economically and most productive age group (15-54years). It has been shown that infection can spread and can be contacted when a handkerchief is contaminated by germs like influenza and the common cold (MIDS, 2013)

1.3 Justification for the study

The review of literatures relevant to this study showed that there is a dearth in literatures on the topic, there was virtually no literature on the use of handkerchief among students globally. This research will be a pilot study in this area and will therefore be a reference source for future researchers interested in conducting further researches in this area.

The findings from this study will serve as an input in designing health education programmes to reach out to students in schools of higher learning and would also contribute or provide the basis for increased health education information on the proper use of handkerchief among students. This will also enable us to know the modalities needed to further educate the public on the proper use of handkerchief and its health benefits.

There is limited literature in the field of Health Promotion and Education on proper usage of handkerchief, this study will therefore contribute to increasing the literatures in this area. Also, this research will serve as scientifically sound guidance for users of handkerchief.

1.4 Research Questions

1. What knowledge do Public Health students have about the use of handkerchief?
2. What are the practices relating to the use of handkerchiefs among public health students?
3. What is the perception of MPH students on handkerchief as a fomite?
4. What are the perceptions of Public health students on the health benefits of using handkerchiefs?

1.5 Research Objectives

1.5.1 General Objective: The general objective of this research was to investigate the knowledge, perception and use of handkerchief as a fomite among public health students in the University of Ibadan.

1.5.2 Specific objectives

The specific objectives were;

1. To assess the knowledge of Public health students on the use of handkerchief.
2. To identify practices relating to the use of handkerchief among public health students.
3. To determine the perception of handkerchief as a fomite among Public Health Students.
4. To examine the perceived health benefit of handkerchief among public health students.

1 6 Research Hypotheses

The following hypothesis were tested by the study

1. There is no significant relationship between the demographic characteristics (age, educational level) of the respondents and knowledge of proper use of the handkerchief.
2. There is no significant relationship between the demographic characteristic (age, educational level) of the respondents and use of handkerchief.
3. There is no significant relationship between the demographic characteristics (age, educational level) of the respondents and their perception of handkerchief as a fomite.
4. There is no significant relationship between knowledge on the use of handkerchief and perception of handkerchief as a fomite.

CHAPTER TWO

LITERATURE REVIEW

2.1 Origin and History of the Handkerchief

The exact age of the handkerchief is difficult to determine. The earliest written evidence of the handkerchief comes from the Roman poet Catullus in the first century A.D. Most often called a sudarium, from *sudor*, to sweat, it was used to shield or veil the face and mouth and to wipe off sweat. In the first century B.C., it remained a luxury for the rich, due to the expensive nature of linen, which was then a prized import. By the first century A.D., when linen was more easily and cheaply imported, the middle and lower classes gained access to the handkerchief (Braun-Ronsdorf, 1967). The uses of handkerchief were also expanding to include such tasks as cleaning and dressing wounds, and cleaning the fingers during a meal. The Roman Emperor Aurelian gave handkerchiefs to people in the theater to greet high-ranking people, a custom which was quickly adopted. Despite its popularity at the fall of the Roman Empire, as the empire waned, the evidence of the handkerchief did too. The middle ages saw little of the handkerchief in either art or literature, until the fourteenth century (Braun-Ronsdorf, 1967).

When the handkerchief appeared in literature again, it was referred to by many names. In the beginning of the fourteenth century, it was called a *pleuvoir*, from the word *pleur*, to rain, tear or cry. By mid-century, it was called a hand cover and hand cover chief, which during the sixteenth century became handkerchief. Frequently, the handkerchief was also referred to as a napkin, the words, as well as the uses, being interchangeable (Braun-Ronsdorf, 1967). Armed with these words, the handkerchief became even more evident.

As the century progressed, handkerchiefs became so valuable that they were listed in France as wills and inventories (Lester and Katherine, 1954). Several children's books back then directed their pupils to mind their manners and use their handkerchief. Erasmus wrote "to wipe your nose on your cap or your sleeve is boorish; it might be alright for pastry-cooks to wipe their noses on their arm or their elbow; to blow your nose in your hand and then, as if by chance, wipe it on your clothes, shows not much better manners. But to receive the secretion of your nose in your handkerchief, at the same time turning slightly away from persons of rank, is a highly respectable matter." A handkerchief in those days was often an heirloom or part of a dowry, handmade from expensive fabric, usually silk, and personally embroidered. Only the nobility possessed such a luxury item. Larger than today's handkerchiefs, it would not be used for

blowing the nose but as a decorative accessory. Its role in medieval literature was as a romantic love token either given to suitor or dropped to provoke a chivalrous response (Phillip, 2014)

2.2 Uses of the Handkerchief

2.2.1 Conventional uses of a handkerchief

The use of handkerchief include drying hands after washing them, drying face after sweating or washing, drying eyes after crying, preventing escape of infected droplets during sneezing or coughing, wiping mucus off the nose after sneezing or blowing the nose etc. Anyone with a few instructions in the childhood can learn these uses and then continue to apply them throughout life. They are simple and do not require too much intelligence or will power to remember and carry out. Handkerchiefs are usually carried in the pocket by males and sometimes by females whose dresses have pockets. Usually females carry tiny handkerchiefs in their closed fists, rolled into balls; some of them put them in their purses. Some women tuck it into their waistband created by tying the saree. Some old fashioned women place it inside the front of their blouses, probably for want of a better place rather than for security or ease of access. Little children who cannot be trusted to bring their handkerchiefs home safely after a visit to some place like school have their handkerchiefs secured to the front of their shirts or blouses (as the case may be) by safety pins. In this position the handkerchief can reach the mouth and nose easily, and the schoolteacher is also aware of the existence of the handkerchiefs, should the need arise. Some old fashioned people still use a handkerchief in this way (Shashank, 2012). Women often had several handkerchiefs in their purses for blowing their noses, for gently patting their moist brows from overexertion, and for fanning themselves when they felt the “vapor” coming on. For the more dramatic inclined female, it was also used to wave farewell to a lover going off to war and to wave goodbye to loved ones from cruise ship (Anais, 2012)

Another use by elite people is to use a handkerchief to protect the clothes from food morsels dropped while eating. The handkerchief is either spread over the lower tummy and thighs, or tucked into the front of the collar at the root of the throat, so that it covers the front of the chest. This is the usual practice while eating in a posh joint (Shashank, 2012)

2.3 Handkerchief and Germs

Germs that cause respiratory infections (colds, influenza, strep throat) are found in saliva and nasal secretions. Sneezing and coughing spreads these germs through the air to other people. These germs can also be spread on contaminated hands or objects, such as handkerchiefs, because they can survive in the environment for hours to days. Contaminated textiles and fabrics are an excellent substrate for bacterial and fungal growth under the appropriate moisture and temperature conditions (Kramer et al, 2006). Consumer concern for hygiene is particularly relevant during cold and flu season. When suffering from a cold, the ability to collect the germs in a tissue and dispose of them quickly may be a smart choice. On the other hand, handkerchiefs may help prevent illness by providing a more substantial barrier between an individual with a cold and those in close contact (Main and Emily, 2013). Disposable tissues are preferred over cloth handkerchiefs for covering your coughs and sneezes when you have a cold or the flu. This is because cloth handkerchief can act as breeding ground for the germs that are causing the infection. Carrying a used handkerchief around when you are sick may spread your germs (SA Health, 2014). The common cold, a viral infection of the upper respiratory tract, can affect all age groups and can be caused by any of up to 200 different viruses. Rhinoviruses cause up to 40% of common colds. Coronaviruses are responsible for up to one-third of common colds. Other causative viruses include parainfluenza virus, respiratory syncytial virus (RSV) and adenovirus. Furthermore, secondary infections produce complications, such as otitis media, sinusitis, or lower respiratory infections including pneumonia, with its risk of mortality, particularly in the elderly. Studies have demonstrated that colds are also a trigger for asthma. RSV is the major cause of viral RT infection in young children worldwide (IFH, 2008). Colds tend to begin slowly, with the first symptom usually a sore throat, followed by sneezing, a runny nose and nasal congestion. Children may also develop a slight fever (raised temperature). Symptoms usually last around 7 days, but may last longer in some people. Viral shedding in nasal secretions can continue for up to 3 weeks (IFH, 2008). Spread of common cold infections is dependent on viruses circulating around the community and a supply of susceptible noses to infect. In isolated communities that do not have regular contact with the rest of the world, the community can be free of colds until visitors introduce new viruses. There are many reports of epidemics of colds occurring in isolated island communities after the landing of a ship that brought in visitors with colds, but the colds die out as the population develops resistance (IFH, 2008)

2.4 Fomites

Fomites consist of both porous and nonporous surfaces or objects that can become contaminated with pathogenic microorganisms and serve as vehicles in disease transmission (Reynolds et al., 2005). The involvement of fomites in viral disease transmission was first recognized long before the identification of pathogenic organisms, when smallpox outbreaks were traced to imported cotton in 1908 (Gerba and Goyal, 1982). The role of fomites in the spread of microorganisms is sometimes belittled as we do not realize the impact of proper cleaning and disinfection procedures to curtail the morbidity associated with fomite transmitted infections such as the norovirus illness (Tammelin et al, 2000).). It is generally accepted that respiratory viruses are spread from person to person via aerosol transmission. Nevertheless, current scientific evidence also suggests that fomites are an important vehicle in the spread of respiratory viruses (Barker et al, 2001).

Currently, laboratory studies, epidemiological evidence, and disinfection intervention studies have generated strong indirect and circumstantial evidence that supports the involvement of fomites as a vehicle in respiratory and enteric virus transmission. Studies from a variety of disciplines investigating viruses clearly support the following:

- (i) Most respiratory and enteric viruses can survive on fomites and hands for varying lengths of time;
- (ii) Fomites and hands can become contaminated with viruses from both natural and laboratory sources;
- (iii) Viral transfer from fomites to hands is possible;
- (iv) Hands come in contact with portals of entry for viral infection; and
- (v) Disinfection of fomites and hands interrupts viral transmission (Barker, et al, 2001)

Studies have demonstrated that RSV, influenza virus, parainfluenza virus, and rhinovirus can survive on hands for significant periods of time and that these viruses can be transferred from hands and fingers to fomites (e.g. handkerchief) and back again (Barker et al, 2001). A significant amount of investigation was carried out during the 1970s and 80s to better understand the mode of transmission of cold viruses. The findings of these investigations are comprehensively reviewed by Goldmann. The commonly held belief is that colds are spread by particles of infected mucous generated by coughs and sneezes. However, increasingly, there is

evidence that colds are transmitted via hands and surfaces. Infection can spread when fingers become contaminated by contact with the infected nose, or when surfaces such as handkerchiefs and tissues, tap and door handles or telephones become contaminated by droplets of infected mucous shed from the nose (Goldmann, 2000). The virus is passed onto another person either by handshaking or when contaminated surfaces are touched by that person. Individuals then infect themselves by touching their own nose or eyes with contaminated hands. Cold viruses deposited on surfaces can remain viable, in large numbers, for several hours and the 'infectious dose' (the number of viral particles required to cause infection) may be very small. For rhinovirus the infective dose may be less than ten particles (Goldmann, 2000).

2.4.1 Role of Fomites in Viral Disease Transmission

During and after illness, viruses are shed in large numbers in body secretions, including blood, feces, urine, saliva, and nasal fluid (Reynolds et al, 2005). Fomites become contaminated with virus by direct contact with body secretions or fluids, contact with soiled hands, contact with aerosolized virus (large droplet spread) generated via talking, sneezing, coughing, or vomiting, or contact with airborne virus that settles after disturbance of a contaminated fomite (i.e., shaking a contaminated blanket) (Rusin et al, 2002; Goldmann, 2000). Once a fomite is contaminated, the transfer of infectious virus may readily occur between inanimate and animate objects, or vice versa, and between two separate fomites (if brought together) (Goldmann, 2000; Sattar, 2001). The Panic study recovered 3 to 1,800 PFU of rhinovirus from fingertips of volunteers who handled contaminated doorknobs or faucets. Using coliphage PRD-1 as a model, Rusin et al., (2002) demonstrated that 65% of virus could be transferred to uncontaminated hands and 34% to the mouth. The nature and frequency of contact with contaminated surfaces vary for each person depending on age, personal habits, type of activities, personal mobility, and the level of cleanliness in the surroundings (Sattar, 2001). Viral transfer and disease transmission is further complicated by variations in virus survival on surfaces and the release of viruses from fomites upon casual contact (England, 1982; Sattar, 2001). Virus survival on fomites is influenced by intrinsic factors which include fomite properties or virus characteristics and extrinsic factors, including environmental temperature, humidity, etc. If viruses remain viable on surfaces long enough to come in contact with a host, the virus may only need to be present in small numbers to infect the host (Reynolds et al., 2005; Bellamy et al., 1998). After contact with the host is

achieved, viruses can gain entry into the host systems through portals of entry or contact with the mouth, nasopharynx, and eyes. Host susceptibility to viruses is influenced by previous contact with the virus and the condition of the host immune system at the time of infection (Goldmann, 2000).

2.4.2 Epidemiological Evidence of Virus Transmission via Fomites

The involvement of fomites in viral disease transmission was first recognized long before the identification of pathogenic organisms, when smallpox outbreaks were traced to imported cotton in 1908 (Gerba and Goyal, 1982). Initially, epidemiology studies on viral disease transmission lacked the scientific methods to detect and distinguish between a variety of bacterial and viral illnesses. Consequently, most epidemiology studies did not identify the microbial cause of a disease, and outbreaks were characterized by disease symptoms only. For example, in 1929 an epidemic of nonbacterial gastroenteritis was described as the winter vomiting disease by epidemiologists (Koopmans, von Bonsdorff, Vinje, de Medici and Monroe, 2002). Molecular methods are now being used by epidemiologists to link enteric and respiratory viruses to disease outbreaks by identifying the viral pathogens in the host and the environment. Several epidemiological studies have supported laboratory studies by indicating environmental contamination as a potential vehicle for virus transmission. During an outbreak in a Honolulu nursing home, it was determined that staff hands or fomites (e.g., towels, handkerchief, medical cart items, etc.) spread influenza virus (Morens and Rash, 1995). An outbreak of coronavirus (SARS) in a Hong Kong apartment complex may have resulted from fecal-oral transmission combined with environmental contamination (Sampathkumar, Temesgen, Smith, and Thompson, 2003). Studies in day care centers have detected rotavirus on various surfaces, including toys, phones, toilet handles, sinks, and water fountains (Keswick, Pickering, DuPont, and Woodward, 1983). Nursing volunteers who touched infected infants or surrounding fomites developed RSV infection, while nurses with no infant or fomite contact did not develop RSV symptoms (Goldmann, 2000). Epidemiological studies also provide additional information by using statistical tools, such as risk assessments and attack rates, to illuminate viral transmission routes. The potential for norovirus transmission via fomites was demonstrated during a wedding reception where the guests suffered a 50% attack rate of gastroenteritis after a kitchen assistant vomited in the sink which was subsequently used for salad preparation (Barker et al, 2001).

When natural rhinovirus colds were studied, rhinovirus was found on 39% of symptomatic individuals' hands. Additionally, volunteers touching contaminated objects and/or the fingers of symptomatic individuals had a higher attack rate of colds if they inoculated their own eyes or nose (Hendley and Gwaltney, 1988). Risk exposure analysis completed after an outbreak of gastroenteritis on a hospital elderly care ward showed that areas where patients vomited were the most significant factor in the spread of norovirus. Another hospital ward study demonstrated that rotavirus-contaminated surfaces increased simultaneously as the number of children ill increased (Soule, Genoulaz, Gratacap-Cavalier, Mallaret, Morand, Francois, Luu, Charvier, Bost-Bru, and Seigneurin. 1999).

2.4.3 Laboratory evidence of Respiratory Virus Transmission via Fomites

Several different viruses cause respiratory infections, including respiratory syncytial virus (RSV), human parainfluenza virus (HPIV), influenza virus (A and B), human coronavirus, rhinovirus, and adenovirus (Couch, 1995). It is generally accepted that respiratory viruses are spread person to person via aerosol transmission (Baker et al., 2001). Nevertheless, current scientific evidence also suggests that fomites are an important vehicle in the spread of respiratory viruses (Baker et al., 2001). Therefore, HPIV transmission by aerosol was considered improbable; however, transmission may take place by surface contamination or close contact. Respiratory viruses cause sneezing and coughing, which expel an estimated 10⁷ infectious virions per ml of nasal fluid (Couch, 1995). Nasal secretions can travel at a velocity of over 20 m per second and a distance greater than 3m (about 10 feet) to contaminate surrounding fomites (Reiling, 2000; Zhao et al., 2005).

Viruses have been isolated on fomites in day care centers and homes (influenza A virus) (Boone and Gerba, 2005), offices (parainfluenza virus) and hospitals (coronavirus, parainfluenza virus, and RSV) (Dowell et al., 2004) using PCR. Studies have proven that RSV, HPIV, influenza virus, coronavirus, and rhinovirus can remain viable on fomites for several hours to several days (Baker, 2001). Studies have demonstrated that RSV, influenza virus, parainfluenza virus, and rhinovirus can survive on hands for significant periods of time and that these viruses can be transferred from hands and fingers to fomites and back again. Indirect evidence from clinical and laboratory studies clearly supports the involvement of fomites in respiratory virus infection. However, direct evidence supporting respiratory virus transmission or infection is still scarce. A study by Gwaltney et al. (1982), observed that 50% of subjects developed infections after

handling a coffee cup contaminated with rhinovirus. The study also demonstrated that rhinovirus self-inoculation can result from rubbing the nasal mucosa with contaminated fingers and could lead to infection.

2.4.4 Laboratory evidence of enteric virus transmission via fomites

Enteric viruses spread by the fecal-oral route. In many disease outbreaks viral transmission occurs via contaminated surfaces (Abad, Villena, Guix, Caballero, Pinto and Bosch, 2001). It has been estimated that one single vomiting incident may produce an estimated 30 million viral particles (Barker et al, 2001). Enteric viruses which cause gastrointestinal symptoms include rotavirus, adenovirus (serotypes 40 and 41), astrovirus, calicivirus (norovirus and sapoviruses), and HAV (40, 41). However, gastrointestinal symptoms like nausea and vomiting are found at a lower frequency in hepatitis A virus infections (Tong, El-Farra and Grew, 1995). In addition, at the peak of an enteric virus infection, more than 10^{11} virions per gram may be excreted in the stool (Barker et al, 2001). Contamination of fomites from enteric viruses can originate from aerosolized vomit or the transfer of vomit and fecal matter from hands to surfaces. Viruses aerosolized from flushing the toilet can remain airborne long enough to contaminate surfaces throughout the bathroom (Goldmann, 2000). Enteric viruses have been detected in carpets, curtains, and lockers, which can serve as viral reservoirs (ISFHH, 2002). Surfaces contaminated (e.g., knives or sinks) by virus- infected individuals during food preparation have been documented to be the source of several food-borne outbreaks (Paulson, 2005). Studies on virus survival have indicated that enteric viruses are viable for at least 45 days on nonporous fomites. A study by Fischer et al. found that rotavirus stored in feces remained infective for 2.5 months at 30°C and 32 months at 10°C (25). In addition, norovirus, adenovirus, and rotavirus have all been isolated from naturally contaminated fomites. Norovirus has been detected on fomites in hotels, hospital wards, and cruise ships during outbreaks of gastroenteritis. Adenovirus has been isolated on drinking glasses from bars and coffee shops, and rotavirus was detected on 16 to 30% of fomites in day care centers (Barker et al, 2001). Very small amounts of enteric virus (e.g., norovirus, estimated at 10 to 100 virions) can cause infection, with many viral infections being largely asymptomatic or subclinical in healthy adults (Barker et al, 2001). As a result, viral shedding onto surfaces or the spreading of virions into the environment by infected individuals can go on undetected (ISFHH, 2002). The spread of HAV, rotavirus, and astrovirus from hands

to fomites and vice versa has been well documented in several studies. Artificially contaminated finger pads transferred 9.2% of HAV to lettuce (Bidawid, Farber and Sattar, 2000). A study by Barker et al, 2001 demonstrated that norovirus could be transferred from contaminated surfaces to clean hands and then contaminated hands could transfer virus to a secondary surface, such as a phone or door handle. It was also found that norovirus-contaminated hands could cross-contaminate a series of seven clean surfaces without additional recontamination of hands (Barker et al, 2004). Viruses can be easily spread to the mouth when fomites and hands become contaminated (Reynolds et al, 2005). A small child puts fingers in his mouth once every 3 minutes, and children up to 6 years average a hand-to-mouth frequency of 9.5 contacts per hour (Tulve et al, 2002).

Like respiratory viruses, laboratory studies documenting direct evidence of enteric virus transmission via surfaces are limited. Overall, laboratory evidence supporting viral transmission via fomites is considered indirect and circumstantial, but it represents an important component in understanding potential virus transmission (Barker et al, 2001).

2.5 Handkerchief as a Fomite

“Disposable tissues are preferred over cloth handkerchiefs for covering mouth when one has a cold or flu. This is because cloth handkerchief can act as breeding ground for the germs that are causing the infection. Carrying a used handkerchief around when one is sick may spread germs” (SA Health, 2014.)

Fomites become contaminated with virus by direct contact with body secretions or fluids, contact with soiled hands, contact with aerosolized virus (large droplet spread) generated via talking, sneezing, coughing, or vomiting, or contact with airborne virus that settles after disturbance of a contaminated fomite (i.e., shaking a contaminated handkerchief) (Reynolds et al., 2005).

There are a number of ways fomites can be contaminated with infectious disease and these include contact with bodily fluids, body parts, or other fomites and settleings from airborne particles by talking, sneezing, coughing, or vomiting (Hota, 2004; Boone and Gerba, 2007). Contamination of a fomite may provide no obvious or visible evidence of infectious disease presence. Additionally, the routes by which an infectious agent contaminates a fomite are equally able to infect a susceptible individual without the intermediate fomite. Contact transmission

involves hands and surfaces. Infected droplets of mucous are deposited on surfaces either by settling of airborne droplets or being touched with contaminated fingers. An individual can pick up the virus if they touch a contaminated surface or shake hands with an infected individual with contaminated hands. They can then become infected if they rub their eyes or nose with contaminated hands when the virus infects the nasal mucosa (IFH, 2008). Fomites play an important role in indirect transmission of norovirus, such as touching a door handle or table contaminated with norovirus (Moe et al, 2001). Survival of norovirus on a fomite can occur for days, making hand washing a particularly important prevention measure when outbreaks occur in the university setting. Unfortunately, common waterless hand sanitizers such as alcohol-based or alcohol-free formulations do not effectively kill norovirus on the hands. Therefore, hand washing with plain soap and water should be recommended and followed during outbreaks of norovirus among students living in closed and crowded settings, such as a residence hall. For these reasons, hygiene is paramount for reducing transmission of a norovirus on campus, including hand washing and decontamination of the environment in which students live and attend classes (Allison and Aiello, 2012). As with the common cold, it is thought that the virus can be spread by inhalation of infected droplets, or by people touching other people, or objects and surfaces that are contaminated with infectious droplets. Infection then occurs by transferring the virus from the hands to the eye(s), nose, or mouth.

2.6 Pathogenesis of some Diseases that can be transmitted by the Handkerchief

2.6.1 Influenza

Influenza virus infection is one of the most common and highly contagious infectious diseases and can occur in people of any age (Tellier, 2009). Influenza, commonly known as "the flu", is an infectious disease of birds and mammals caused by RNA viruses of the family Orthomyxoviridae, the influenza viruses. The most common symptoms are chills, fever, runny nose, sore throat, muscle pains, headache (often severe), coughing, weakness/fatigue and general discomfort. Although it is often confused with other influenza-like illnesses, especially the common cold, influenza is a more severe disease (Eccles, 2005). Influenza is a more serious respiratory tract illness, although there is a wide spectrum of severity of illness ranging from minor symptoms through to pneumonia and death. Common symptoms of flu include sudden

onset of fever, headache, chills, fatigue, muscle aches and pains, runny nose, sore throat and dry cough. The symptoms quickly become more severe than those of a common cold (IFH, 2008). Influenza is an illness that often includes a cough and other respiratory symptoms that can quickly spread from person to person.

Direct contact occurs when influenza is transferred person-to-person, such as through aerosols or very small droplets, produced by a sneeze that is directly deposited into the lungs of a nearby individual. Indirect contact occurs when influenza is spread through an intermediate object or fomite, such as an influenza contaminated table, door handle, clothing (Boone and Gerba, 2005) or other object. Once the object is contaminated from a cough, sneeze or contaminated hands or handkerchief, a susceptible individual may be exposed to the virus by touching the object and then touching their nose, eyes or mouth. Some respiratory viruses can survive for days on surfaces. For example, influenza and norovirus has been shown to survive anywhere from a few hours to a day, depending on the type of surface, pH, temperature and humidity (Boone and Gerba, 2007)

2.6.2 Common Cold

The common cold also known as nasopharyngitis, acute coryza, head cold or simply a cold is a viral infectious disease of the upper respiratory tract which primarily affects the nose. Symptoms include coughing, sore throat, runny nose, sneezing and fever which usually resolve in seven to ten days, with some symptoms lasting up to three weeks. No cure for common cold exists but the symptoms can be treated. It is the most frequent infectious disease in human with average adult getting two to three colds a year and the average child getting between six and twelve. This infection has been with humanity since antiquity (Ronald and Olaf, 2009). The common cold virus is typically transmitted via airborne droplets (aerosols), direct contact with infected nasal secretions or fomite (contaminated objects) (Ronald and Olaf, 2009) Transmission is common in day care and at school due to the proximity of students and frequently poor hygiene

2.7 Health Benefits of the Handkerchief

Seeing people block their mouths and noses with handkerchiefs during dusty conditions is not uncommon (Van der Sande et al, 2008; Jefferson et al., 2007; Lai et al, 2012). Consumer concern for hygiene is particularly relevant during cold and flu season. When suffering from a cold, the ability to collect the germs in a tissue and dispose of them quickly may be a smart choice. On the other hand, handkerchiefs may help prevent illness by providing a more substantial barrier between an individual with a cold and those in close contact (Main and Emily, 2013). Recently, many events have transpired related to hazardous air pollutants such as yellow-sand dust, foot-and-mouth disease, and avian influenza in Asia and other regions. Personal protective equipment (PPE) is often regarded to be a last resort measure after substitution, isolation, and ventilation in occupational hygiene areas. However, ordinary citizens use masks and even handkerchiefs as first-protection devices against the inhalation of external harmful substances such as influenza particles and dust. These masks and handkerchiefs are used with the belief that they protect the wearer. They vary widely in style, and can be found in a broad range of market, hospital, and health-care settings (Lai et al., 2012).

Handkerchiefs have been shown to have medical uses; some people use a handkerchief for fomentation of the eye. It is rolled into a ball, warmed by exhaling deeply into it for some time, and then pressed firmly over the eye to be fomented. A 2007 analysis of measures such as isolation, quarantine, social distancing, barriers, personal protection and hygiene to prevent the spread of viruses such as influenza and SARS, indicated that hand washing and wearing masks, gloves and gowns were effective individually in preventing the spread of respiratory viruses, and were even more effective when combined (Jefferson et al., 2007). Evidence that measures such as hand hygiene, can reduce spread of influenza comes from the SARS outbreaks in Hong Kong, which coincided with the latter part of influenza season, when it was observed that, as extensive personal and community public health measures took place, influenza case numbers fell significantly, more so than usual for the time of year (Lo et al, 2003)

2.8 Conceptual Framework of the Study

Health Promotion and Education is an applied social science for health development. It emphasizes voluntary adoption of health promoting behaviours and attitudes which must be planned on a thorough diagnosis of the social, psychological, economic, political, cultural and environmental factors that influence human behaviour in relation to their health (Tones & Green, 2004). The use of various models in determining the relationship between variables has provided the opportunity to have in-depth understanding of all the cause-and-effect of factors that influence individual's, families' and communities' health. The Health Belief Model is used in this study to explain human behavior as it relates to knowledge, perception and use of handkerchief as a fomite among Public health students in university of Ibadan.

2.8.1 Health Belief Model (HBM)

This is a psychological model that attempts to explain and predict health behaviors. It focuses on the attitudes and beliefs of individuals. The HBM was first developed in the 1950s by social psychologists Hochbaum, Rosenstock and Kegels working in the U.S. Public Health Services (Rosenstock, 1974). It is a goal setting theory based on the level of aspiration in which the individual sets the target of future performance based on past performance (Maiman and Becker, 1974). The model was developed in response to the failure of a free tuberculosis (TB) health screening program. The TB screening program provided adults with free TB screening x-rays from mobile units conveniently located in various neighborhoods. When few adults came out for the free services, program organizers began investigating why more adults did not come out. Hochbaum, however, began to study what motivated the few who did come out. He quickly learned that their perceived risk of the disease and perceived benefits of action were crucial factors in their motivation (Sharma & Romas, 2012).

The model was first presented with only four key concepts: Perceived Susceptibility, Perceived Severity, Perceived Benefits, and Perceived Barriers. The concept of Cues for Action was added later to "stimulate behavior." Finally, in 1988, the concept of Self-Efficacy was added to address the challenges of habitual unhealthy behaviors such as smoking and overeating (Glanz, 1997).

The HBM is made of six constructs which include perceived susceptibility, perceived severity, perceived benefits, perceived barriers cue to action and self-efficacy.

The theoretical framework is illustrated in the diagram below

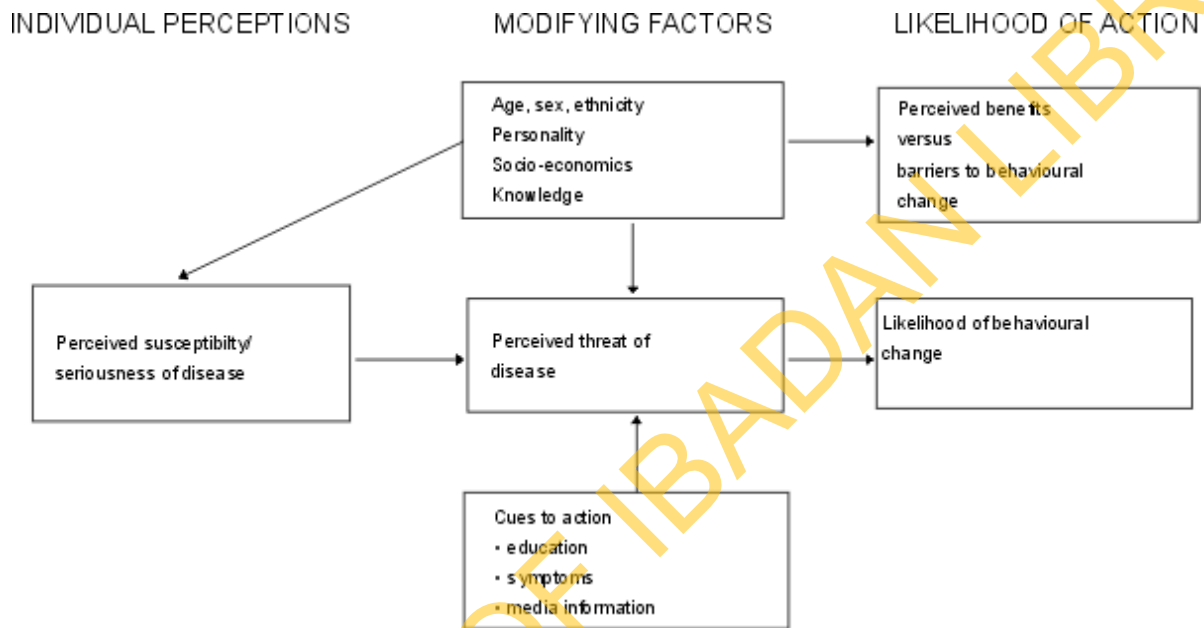


Figure 2.1: Conceptual frame work of the Health Belief Model

Source: Glanz et al, 2002, p. 52

Application of the HBM to the spread of Application of the HBM to STI prevention through promotion of STI Screening

- **Perceived Susceptibility:** Youth believe they may have been exposed flu virus.
- **Perceived Severity:** Youth believe the consequences of having flu virus or related infections without knowledge or treatment is significant enough to try to avoid.
- **Perceived Benefits:** Youth believe that the recommended action of getting tested for the infections — possibly by allowing them to get early treatment or preventing them from infecting others.
- **Perceived Barriers:** Youth identify their personal barriers to getting tested (i.e., getting to the clinic or being seen at the clinic by someone they know) and explore ways to eliminate or reduce these barriers (i.e., brainstorm transportation and disguise options)
- **Cues to action:** Youth receive reminder cues for action.
- **Self-Efficacy:** Youth receive guidance (such as information on where to get tested) or training (such as practice in making an appointment).

The above can be illustrated in the theoretical framework below;

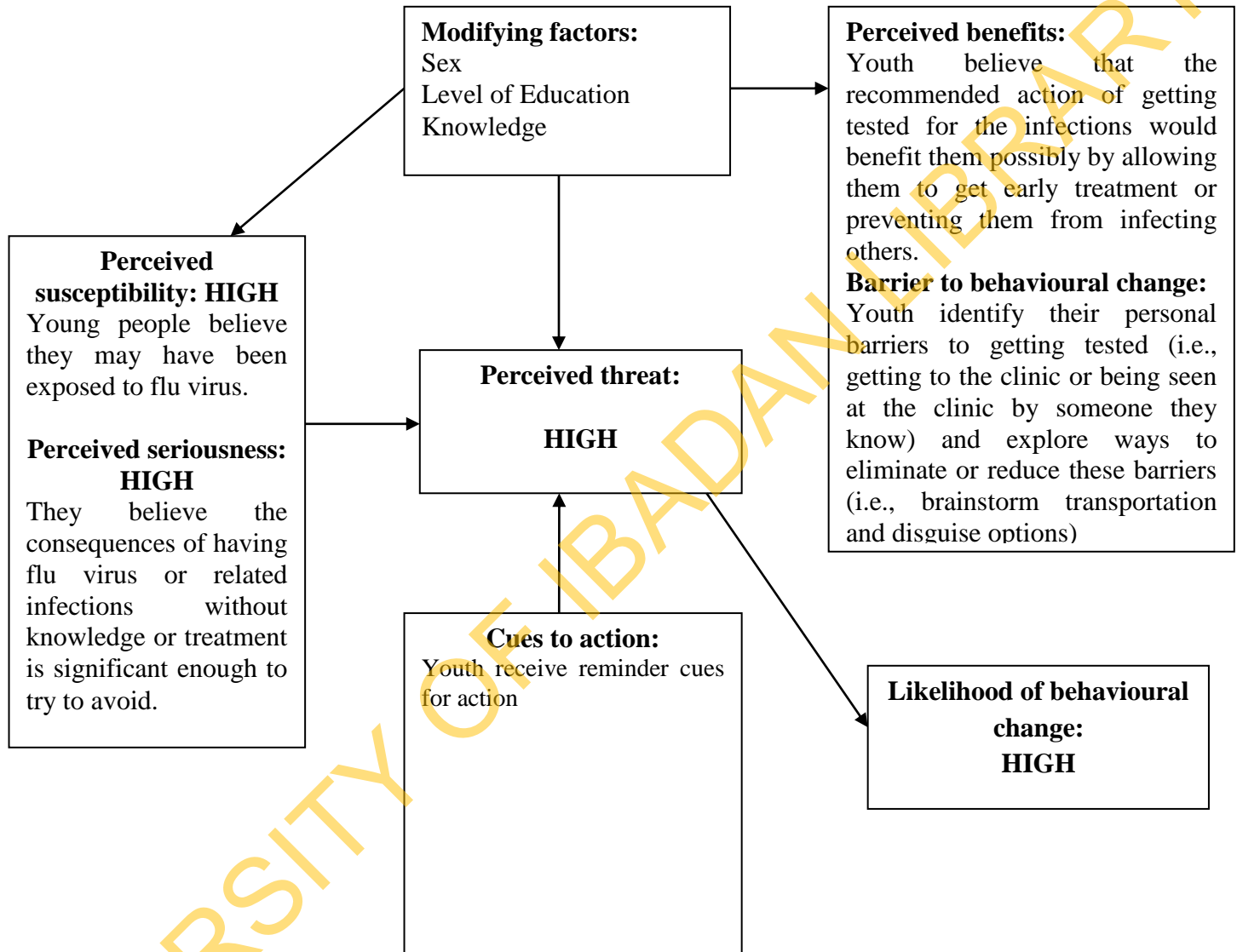


Figure 2.2 Conceptual framework as adopted for the study

CHAPTER THREE

METHODOLOGY

3.1 Study Design

This study was a descriptive cross-sectional survey that set out to investigate the Knowledge, perception and use of handkerchief as a fomite among public health students in University of Ibadan, Oyo State Nigeria.

3.2 Description of Study Area

The study was carried out among public health students of the Faculty of Public Health, college of medicine, University of Ibadan, Ibadan, Oyo State. University of Ibadan (UI) is the oldest and one of the most prestigious Nigerian universities, and is located five miles (8 kilometers) from the center of the major city of Ibadan in Western Nigeria. The University was established on the 1st of August 1948. Besides the College of Medicine, other faculties in the university includes, Agriculture and Forestry, arts, basic Medical sciences, Dentistry, Education, law, Pharmacy, Public Health, Science, Social sciences, Technology, Veterinary Medicine and other academic departments. The University has residential and sports facilities for staff and students on campus, as well as separate botanical and zoological gardens. The university is primarily residential with magnificent halls of residence for male and female students. There is provision for the accommodation of post-graduate students. There are Internet cafés, Knowledge Hubs, cafeterias, Laundry centers, Mini marts, Press boards, common-rooms, gymnasias (in some halls), kitchenettes, etc. There is impressive water and electricity supply. Electricity supply is also augmented by the inverter system. Football and table tennis are sports majorly played and watched by students. The Halls of Residence are semi-autonomous. Each Hall of Residence has a Management Committee, which is responsible for matters of general policy for the social, cultural and intellectual activities of the Hall. The Management Committee is given powers to arrange its own social, cultural and intellectual activities designed to preserve, develop and enrich the traditions of the Hall and make life in the Hall generally interesting and worthwhile. The faculty of Public Health is situated in the College of Medicine University of Ibadan.

3.3 Study Population

The study population consists of students of public health undergoing full time programmes in the various departments in the Faculty of Public Health, College of medicine University of Ibadan Oyo State and consented to participate in the study.

3.4 Inclusion Criteria

Students in the Faculty of Public Health in the University who gave informed consent to participate in the study.

3.5 Exclusion Criteria

Students who refused to give informed consent to participate in the study were excluded.

3.6 Sample Size Determination

Using Kish and Leslie's formula, 50% prevalence of knowledge of the use of handkerchief, confidence interval at 95% and 5% margin error, the minimum sample size was 384.

This estimated value was obtained as shown below:

$$n = \frac{Z^2pq}{d^2} \text{ (Leslie Kish Formula)}$$

Where $z = 1.96$, (level of significance of 5% (1.96))

$p = 50\%$ (It is 50% because there is no prevalence of the knowledge, use and perception of handkerchief as a fomite)

$$q = 1 - p = 1 - 50\% = 50\% = 0.50$$

$d = 5\%$ (Difference)

$n =$ minimum sample size

$$n = \frac{1.96^2 \times 0.50 (1 - 0.50)}{0.05^2}$$

$$n = 384$$

Estimate for non-response = assumed 10% of the minimum sample size

$$\frac{384 \times 10}{100} = 38$$

$$100$$

Therefore, the minimum sample size for the study = $384 + 38 = 422$

3.7 Sampling Technique

A Two-stage sampling technique was used to select 422 students from the student population. The sampling technique involved the departments in the Faculty of Public Health.

Stage 1: Proportionate sampling technique was used to select sample from various departments in the faculty of College of Medicine to have fair representation.

The proportion for each department was calculated thus:

$$\text{Proportion} = \frac{\text{Total No. of students in the Department}}{\text{Total number of Students in the faculty}} \times \text{Total number of students required}$$

Stage 2: Simple random sampling technique was used to select a sample from the selected departments.

Table 3.1: Proportionate sampling procedure used to determine number of students selected from the departments.

S/N	Department	Proportion calculated	No. of Students Required
1.	Environmental Health Sciences	$\frac{85}{793} \times 422 = 45.2$	45
2.	Epidemiology and Medical Statistics	$\frac{210}{793} \times 422 = 111.7$	112
3.	Health Policy Management	$\frac{57}{793} \times 422 = 30.3$	30
4.	Health Promotion and Education	$\frac{133}{793} \times 422 = 70.8$	71
5.	Human Nutrition	$\frac{240}{793} \times 422 = 127.7$	128
6.	Institute of Child Health	$\frac{43}{793} \times 422 = 22.9$	23
7.	Preventive Medicine and primary care	$\frac{25}{793} \times 422 = 13.3$	13
Total			422

3.8 Instrument for Data Collection

The instrument used was a self-administered semi-structured questionnaire which was designed by the researcher using information gotten from literatures on the use of Handkerchief. The questionnaire was made up of forty four (44) semi structured questions which were grouped into 5 sections (A-E) as shown below:

Section A: Socio- demographic characteristics of the respondents.

Section B: Knowledge on the use of Handkerchief.

Section C: The use of handkerchief.

Section D: Perception of Handkerchief as a fomite.

Section E: Perceived Health Importance of Handkerchief.

3.9 Validity and Reliability of the Research Instrument

3.9.1 Validity

A draft of the questionnaire was developed by the researcher. The questions in the questionnaire were drawn in English since the study populations were Public Health students who are literate in English language. The questions were developed from information gathered from relevant literatures guided by the research objectives. The instrument was further validated by giving it out to peers and lecturers in the department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan, for review and corrections. The final validation was done by the project supervisor.

3.9.2 Reliability

The reliability of the instrument was ensured by conducting a pre-test among forty two (10% of minimum sample size) students in another institution with similar characteristics, with a draft of the questionnaire to determine its consistency and accuracy. After collection of the questionnaires, the data were coded and entered into SPSS version 16.0 and the Cronbach's Alpha test was applied to it to determine the reliability co-efficient. The value obtained was 0.8 which was close to one and hence the instrument was found to be reliable. However, few revisions were made based on the analyses of the results of the pre-test.

3.10 Method of Data Collection

Four research assistants who were literate, mature and have had previous experiences on data collection were recruited and trained for two days. They helped in administering the questionnaires. The contents of the training include purpose of the study, interpersonal

communication and data collection procedures. The survey was self-administered unless clarifications were sought from research assistants on any item or question. Questionnaires were administered simultaneously to the participants by the research assistants. To ensure privacy, the study participants were allowed to complete the questionnaires wherever they felt comfortable so long as they can return to submit to the research assistants.

3.11 Data Management and Analysis

The data collected were checked for completeness and accuracy in the field. Serial number was assigned to each questionnaire for easy identification and for correct data entry and analysis. The data were entered and analyzed using SPSS statistical tool Version 20. The dependent variables were knowledge, use and perception of Handkerchief while the independent variables were age, sex, religious beliefs, and marital status.

Data analyses were done using SPSS software (version 20). Simple descriptive statistics (Frequency, percentages and mean) as well as Chi square (χ^2) tests (at $p=0.05$ level of significance) were used for the analyses. Cross tabulations of the independent variables (demographics) against the outcome variables (knowledge and use of handkerchief) were carried out.

Data on knowledge were analyzed by assigning 2 points to each correct answer while zero point for both incorrect and don't know answers provided by the respondents. This resulted in an 18-point knowledge score, with 0 being the lowest and 18 the highest points. High score signified high knowledge (\geq mean) on the use of handkerchief. Low score signified low knowledge ($<$ mean) on the use of handkerchief. Since knowledge is a continuous variable, t-test statistics was used to compare the mean score between those who ever used handkerchief and those who never used. The respondents were asked to respond appropriately to the list of constructed perception statements, using 2-point scale of Agree (A) and Disagree (D).

Scoring:	A	D
Positively worded	2	1
Negatively Worded	1	2

This resulted in a 20-point perception score; with 10 and 20 being the lowest and highest points, respectively. High score signified high perception (\geq mean) of handkerchief as a fomite while low score signified Low Perception ($<$ mean) of handkerchief as a fomite.

Also, the respondents' perceived Health Importance of handkerchief were analysed using 2-point Likert-type scale of Agree (A) and Disagree (D).

Scoring:	A	D
Positively worded	2	1
Negatively Worded	1	2

This resulted in a 12-point perceived health importance score; with 6 and 12 being the lowest and highest points, respectively. High score signified high perceived (\geq mean) health importance of handkerchief while low score signified Low Perceived ($<$ mean) health importance of handkerchief as a fomite. Perception score of handkerchief as a fomite was calculated for each respondent using 20 point perception scale. Each correct answer had a point score of 2 and wrong answer has a point score of 1. The score were summed up to give a composite point score for each respondent. Category codes were allotted to each respondent in order to know if they have Low or High perception.

3.12 Ethical Consideration

Permission was gotten from concerned departmental heads before the study. Also, the students were given full details concerning the research before being asked to take part in it so as to ensure that they fully understood the research. There was no coercion to participate and the decision to participate was solely that of the students. In addition, informed consent was obtained from the students prior to filling of the questionnaires. The privacy, confidentiality and anonymity of the research participants were ensured as the questionnaire used for data collection was rid of all identifiers. The study was noninvasive and relatively risk-free.

3.13 Limitation of the study

The study is limited in that it was carried out in a school environment involving 390 students thereby making the research participants very selective. Any generalization of the results of this study must be made with caution. Handkerchief was not seen as a sensitive topic because they only know it to prevent the spread of infection. As such, some could be bias in filling the questionnaire and take a longer time for them to fill

CHAPTER FOUR

RESULTS

4.1 Socio-demographic Characteristics

A total of 390 respondents participated in the study. The departments used for the study had the following respondents: Health Promotion and Education, Environmental Health Sciences, Epidemiology and Medical Statistics, Preventive Medicine and Primary Care, Institute of Child Health, Health Policy and Management, and Human Nutrition 68(17.4%), 42(10.8%), 98 (25.1%), 13(3.3%), 21(5.4%), 28(7.2%), 120(30.8%) participants respectively.

Majority (62.3%) of the respondents were females. The ages of the respondents ranged from 20 to 49 years with a mean age score of 27.47 ± 4.28 years. Majority (60.8%) of the respondents fell between the age group of 25 to 29 years. The levels of study of the respondents were MPH1, MPH2 and others, with respective percentages of 51.3%, 32.6 and 16.2%. Majority (75.4%) of the respondent lived off campus. Majorities were Christians (89.7%) and singles (83.6%). 75.9% were Yoruba, which was the major tribe in the study. Majority (85.9%) used handkerchief while (37.7%) did not have a handkerchief with them as at when the questionnaires were administered.

Table 4.1: Distribution of respondents by their Socio-demographic characteristics (n= 390)

Socio-demographic Characteristics	No	%
Gender		
Male	147	37.7
Female	243	62.3
Total	390	100.0
Age		
≤24	78	20.0
25-29	237	60.8
>29	75	19.2
Total	390	100.0
Department		
Health promotion and education	68	17.4
Environmental Health Sciences	42	10.8
Epidemiology and Med. Statistic	98	25.1
Preventive Med. and primary Care	13	3.3
Institute of Child health	21	5.4
Health policy Management	28	7.2
Human Nutrition	120	30.8
Total	390	100.0
Level of Study		
Year One	200	51.3
Year Two	127	32.6
Others	63	16.1
Total	390	100.0
Do you have one (handkerchief) now?		
Yes	243	62.3
No	147	37.7
Total	390	100.0

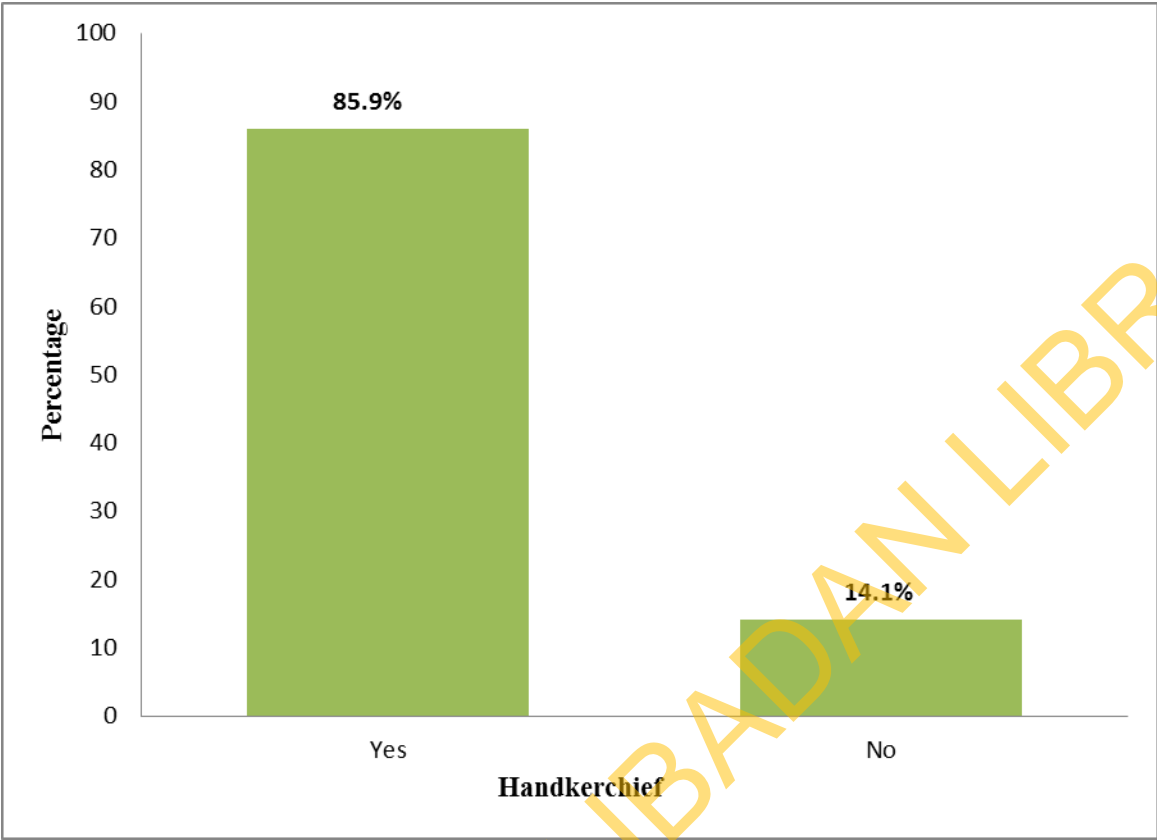


Figure 4.1 Distribution of Respondents' Use of Handkerchief

4.2 Knowledge of Use of handkerchief

This section provides results on questions relating to the respondents' knowledge on the use of handkerchief. Majority (85.6%) said the colour of a standard handkerchief to be used as a preventive tool against respiratory infections should be white. Majority (72.3%) said they preferred this colour because when it is dirty or contaminated, one can easily see or notice it. Majority (79.7%), said the quality of the fabric of a standard handkerchief should be cotton. Majority (88.7%), said handkerchief should be kept inside the pocket or handbag of ladies as part of dressing. Some (40.8%) said it should be kept within this place to prevent it from contamination. Majority (80.0%) of the respondents agreed that a handkerchief should be washed appropriately after used. Majority (62.8%) said after washing and drying a handkerchief, it should be treated by ironing. Some (49.7%) of the respondents said a handkerchief should be wash daily after use. In stating one of the preventive health reasons for the use of a handkerchief, majority (75.4%) were able to state correctly some preventive health reasons for the use of handkerchief.

Table 4.2: Distribution of Respondents' Knowledge of use of handkerchief (n=390)

Statement	Response	Frequency	Percentage
What should be the colour of a standard handkerchief to be use as a preventive tool for respiratory infections	Correct (white)	334	85.6
	Wrong	56	14.4
Why is this Colour preferred	Correct (It reveals dirt and stain)	282	72.3
	Wrong	108	27.7
What should be the quality of the fabric material of a handkerchief	Correct (cotton)	311	79.7
	Wrong	79	20.3
Where should the handkerchief be kept as part of your dressing when you go out	Correct (Pocket/bag)	306	88.7
	Wrong	84	11.3
Why should you keep it within this place?	Correct (To reduce contamination)	159	40.8
	Wrong	231	59.2
How should you wash a handkerchief; Separate or With other fabrics?	Correct (Separate)	312	80.0
	Wrong	78	20.0
How should you treat a handkerchief after washing and drying.	Correct (by ironing)	245	62.8
	Wrong	145	37.2
How long are you supposed to use a handkerchief before washing.	Correct (daily/a day)	194	49.7
	Wrong	196	50.3
State one main preventive health reasons for the use of handkerchief	Correct (prevent spread of airborne disease)	294	75.4
	Wrong	96	24.6

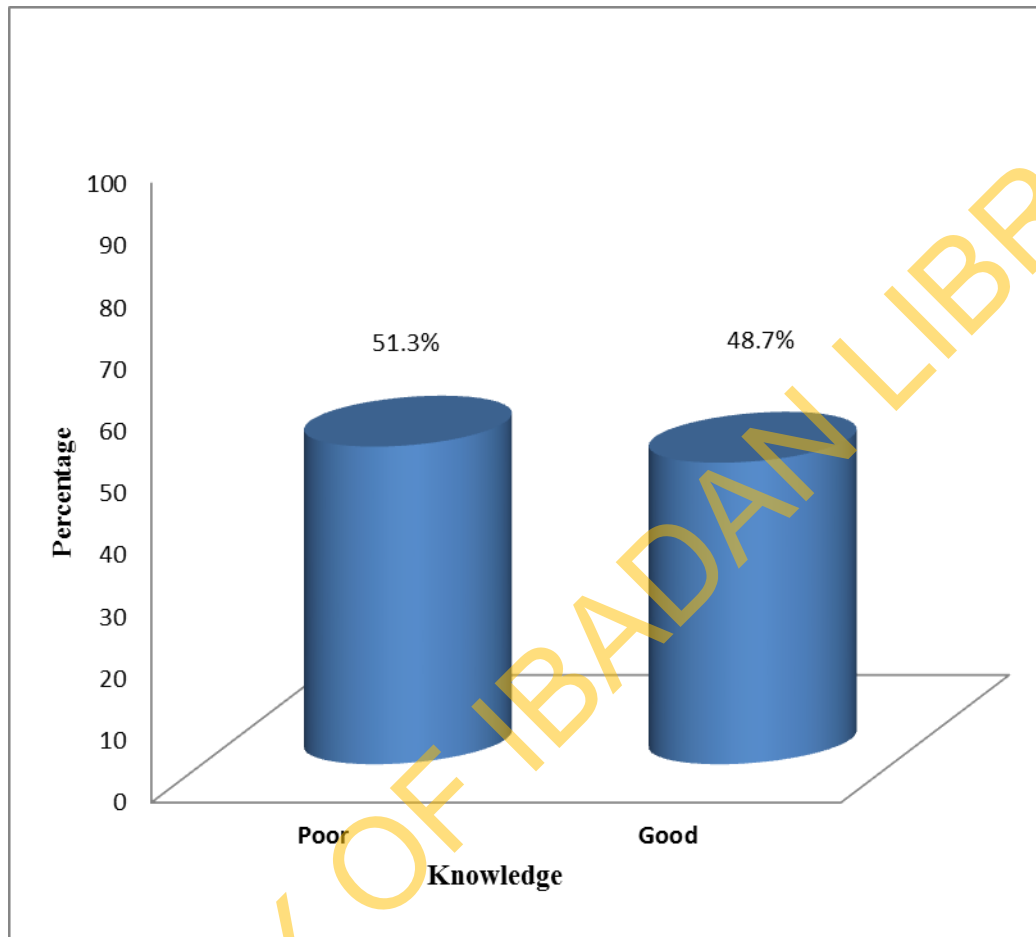


Figure 4.2: Categorisation of respondents' Knowledge of use of handkerchief

Mean score=12.5, SD=3.32

Poor score (1-12)

Good score (>12)

4.3 Respondents' Use of Handkerchief

This section provides results on questions relating to the respondents' use of handkerchief. Majority (76.2%) said they used one handkerchief per day while few (14.1%) do not use handkerchief at all. Varying and multiple responses as shown in the table (Table 4.3) were gotten when the question was asked why do you use more than one handkerchief?. Majority (75.1%) said their handkerchiefs were made of cotton. Also, varying and multiple responses as shown in table 4.3 were given when the question was asked what you use handkerchief for. 42.1% said they use their handkerchief to wipe their nose, face and to clean sweat. Majority (62.3%) said they used white colour handkerchief when asked what is the colour of your handkerchief?. Majority (83.6%) said they do not share their handkerchief with another person. Majority (79.0%) also said they can recommend the use of handkerchief to others. Majority (69.7%) said they prefer the use of handkerchief to tissue paper. 91(23.3%) claimed the reason they prefer handkerchief was because tissue paper breaks and leaves particles on their faces, 50(12.8%) said handkerchief is durable and absorb more than tissue paper.

Table 4.3a: Distribution of respondents by their use of handkerchief

Statement	Response	Frequency	Percentage
Number of handkerchief use per day	0	55	14.1
	1	297	76.2
	>1	38	9.7
Reason for using more than one	Use the other if one is dirty and because I sweat a lot	25	6.4
	For different purposes	13	3.3
	To help clear nose during cold	8	2.1
	And when I have catarrh		
	For different part of my body	5	1.3
	And when one is dirty		
	Prevent cross contamination	3	0.9
Material your handkerchief is made of	No response	294	75.4
	Not applicable	55	14.1
	Cotton	293	75.1
	Wool	13	3.3
	Others fabrics	9	2.4
Use handkerchief	No response	20	5.1
	Not applicable	55	14.1
	Wiping of nose, face and sweat	164	42.1
	Cleaning of sweat and covering of mouth when coughing	131	33.6
	Cleaning of shoe	3	0.9
Colour of handkerchief	Cleaning of hand, Face and sweat	18	4.6
	Cover the mouth when coughing and sneezing and wiping of face	47	12.1
	No response	11	2.8
	White	243	62.3
Colour of handkerchief	Blue	17	4.4
	Pink	8	2.1
	Brown	6	1.5
	Other colours	15	4.0
	Mixed colour	46	11.8

Table 4.3b: Distribution of respondents by their use of handkerchief

Statement	Response	Frequency	Percentage
Share handkerchief with another person	Yes	9	2.3
	No	326	83.6
Recommend the use of handkerchief to others	Yes	308	79.0
	No	21	5.4
	No response	6	1.5
Prefer the use of handkerchief to tissue paper.	Yes	272	69.7
	No	56	14.4
	No response	7	1.8
Reasons	H. is hygienic.	31	7.9
	H. is durable and absorb more.	50	12.8
	H. can be wash and reuse	30	7.7
	H. is cheaper.	11	2.8
	Tissue breaks easily and stains the face.	91	23.3
	Tissue is expensive and hygienic	3	0.9
	Tissue does not absorb	9	2.3
	Tissue is disposable	11	2.8
	Allergic to tissue	4	1.0
	No response	95	24.4

4.4 Perception of handkerchief as a fomite

This section provides results on questions relating to respondents' perception of handkerchief as a fomite. The majority of the respondents 361(92.6%) agreed that handkerchief can serve as a vehicle for the spread of pathogenic organisms. More than half 258(66.2%) disagree that pathogenic organisms cannot be transmitted by a handkerchief. Few of the respondents 112(28.7%) disagreed that pathogenic organism can remain in an infected handkerchief for several hours. Majority of the respondents, 346(88.7%) agreed that pathogenic organisms can be transmitted to a handkerchief when it comes in contact with a contaminated surface. Majority (81.8%) of the respondents disagreed that using a contaminated handkerchief to wipe ones nose cannot cause one to be infected. Majority (70.5%) agreed that once a (fomite) handkerchief is contaminated, the transfer of pathogenic organisms can readily occur between two objects. The majority (84.1%) of the respondents agreed that by touching a contaminated handkerchief surface, one can pick up pathogenic organism. Virtually (92.3%) all the respondents agreed that handkerchief can be contaminated with infectious diseases through contact with body fluid. 64.1% of the respondents agreed that when a handkerchief touches a body part, it can be contaminated with an infectious disease. Majority (72.6%) agreed that other fomite can contaminate a handkerchief with infectious diseases when they come in contact (see table 4. for details)

Table 4.4: Distribution of Respondents' Perception of Handkerchief as a fomite (n=390)

Statement	Agree	Disagree
Handkerchief can serve as a vehicle for the spread of pathogenic organisms	361 (92.6)	29 (7.4)
Pathogenic organisms cannot be transmitted by handkerchief	132 (33.8)	258 (66.2)
Pathogenic organisms can remain in an infected handkerchief for several hours	278 (71.3)	112 (28.7)
Pathogenic organisms can be transmitted to a handkerchief when it comes in contact with a contaminated surface	346 (88.7)	44 (11.3)
Using a contaminated handkerchief to wipe your nose cannot be infected	71 (18.2)	319 (81.8)
Once a (fomite) handkerchief is contaminated, transfer of pathogenic organisms can readily occur between two inanimate and animate object	275 (70.5)	115 (29.5)
An individual can pick up pathogenic organisms if he/she touches a contaminate handkerchief surface	328 (84.1)	62 (15.9)
Handkerchief can be contaminated with infectious diseases through contact with body fluid	360 (92.3)	30 (7.7)
When a handkerchief touches a body part, it can be contaminated with infectious diseases.	250 (64.1)	140 (35.9)
Other fomites can contaminate a handkerchief with infectious disease when they come in contact	283 (72.6)	107 (27.4)

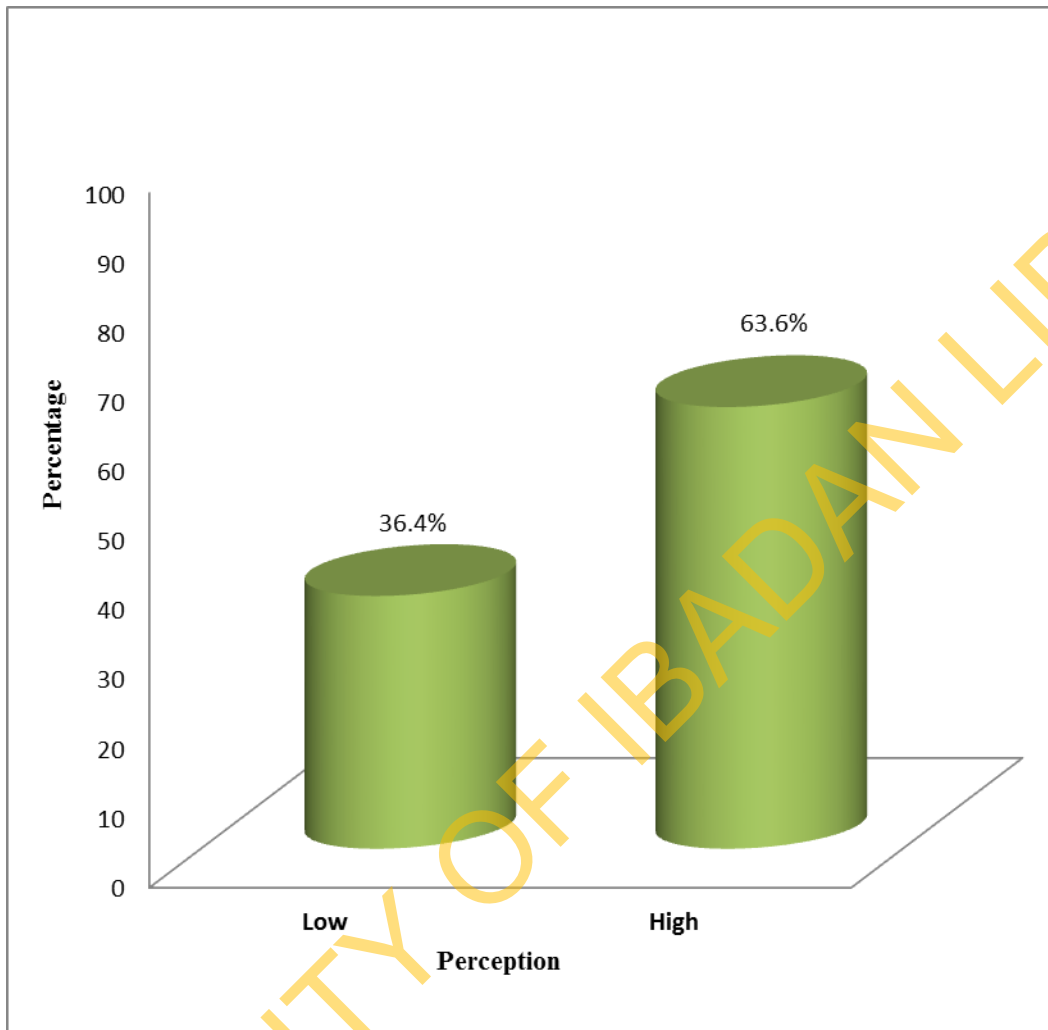


Figure 4.3 Categorisation of respondents' perception

Mean score=17.8, SD=3.33

Low score (11-17)

High score (>17)

4.5. Perceived health importance of handkerchief

The respondents perceived health benefits of the use of handkerchief as depicted in the table below shows that majority (80.0%) disagreed that handkerchief does not have any health benefit. Majority (87.9%) of the respondents agreed that a handkerchief can be used as a device to protect against inhalation of harmful substances. Majority (71.0%) agreed that a handkerchief can actually help prevents the spread of diseases like flu. Majority (92.8%) disagreed that they cannot contact infection if they share their handkerchief with someone that has flu virus. A few (6.4%) of them agreed that a handkerchief can only prevents respiratory infection if a chemical is sprayed on it while some (57.2%) disagreed. Majority (66.9%) agreed that handkerchief may help prevents illness by providing a more substantial barrier between an individual with cold and those in close contact.

Table 4.5: Distribution of Respondents' Perceived Health importance of use of Handkerchief

Statement	Agree	Disagree
Does not have any health use	78 (20.0)	312 (80.0)
Can be used as a device to protect against inhalation of harmful substances.	343 (87.9)	47 (12.1)
Can help prevent the spread of diseases such as flu	277 (71.0)	113 (29.0)
Cannot contact infection if handkerchief is shared with someone that has Flu virus	28 (7.2)	362 (92.8)
Only prevents disease if a chemical is spread on it.	167 (42.8)	223 (57.2)
May help prevent illness by Providing a more substantial barrier between an individual with cold and those in close contact	261 (66.9)	129 (33.1)

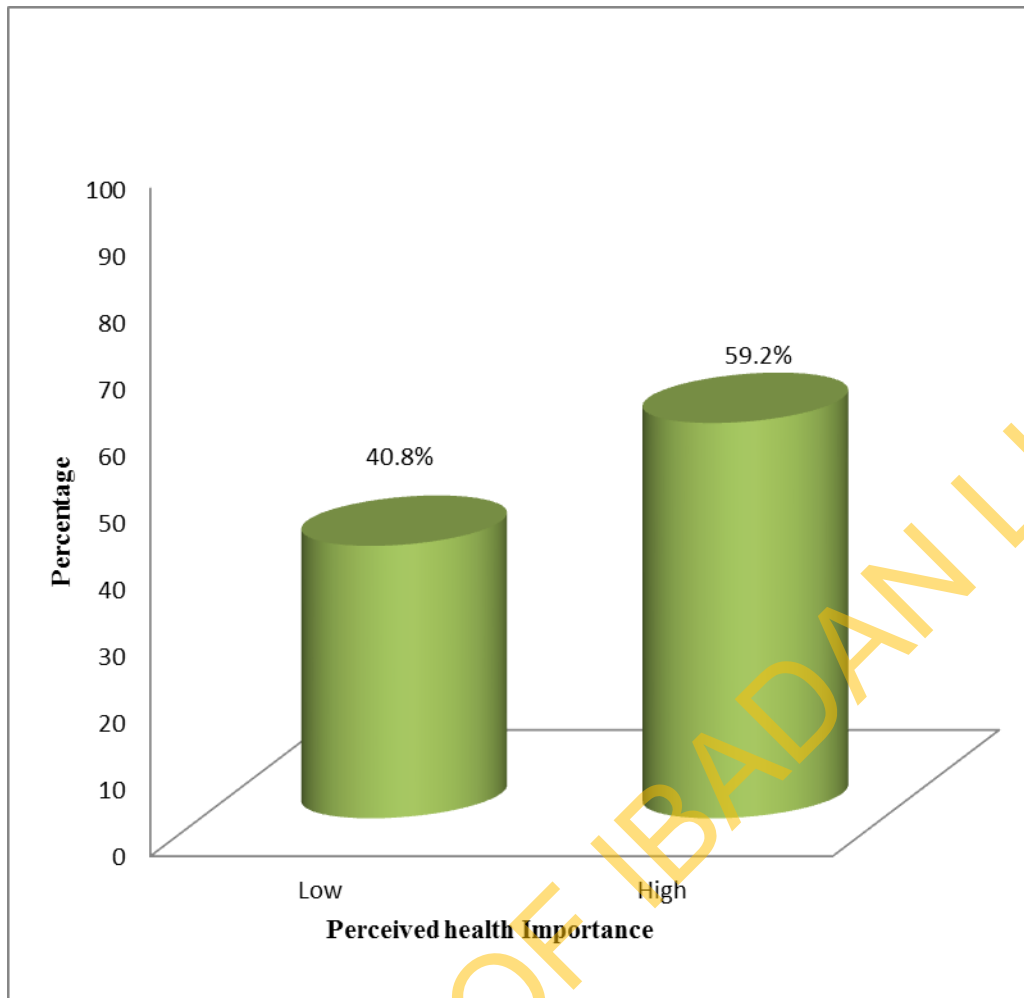


Figure 4.4: Categorization of respondents Perceived health importance of handkerchief

Mean score=10.6

Low score (6-10)

High score (>10)

4.6 Hypothesis Testing

4.6.1 Null Hypothesis One

There is no relationship between the Socio-demographic characteristics (Sex and Department) of the respondents and their knowledge of the use of handkerchief.

The tables below show the results of the Chi-square for some selected socio-demographic characteristic, (Sex and Department) of the respondents and knowledge of the use of handkerchief. The results show that the socio-demographic characteristics of the respondents and their knowledge on the use of handkerchief using the Chi-square test had a significant relationship with Sex ($X^2=4.040$, $p=0.048$) in the direction of the females, and a Non-Significant relationship with Department ($X^2=7.019$, $p=0.319$).

Table 4.6.1: Relationship between Sex and Knowledge of respondents' use of handkerchief

Sex	Knowledge Category		Total
	Poor	Good	
Male	85(57.8%)	62(42.2%)	147
Female	115(47.3%)	128(52.7%)	243
Total	200(51.3%)	190(48.7%)	390

$\chi^2 = 4.040$; $df = 1$; $p = 0.048$

Table 4.6.2: Relationship between Course of study and Knowledge of respondents' use of handkerchief

Department	Knowledge Category		Total
	Poor	Good	
Health Promotion And Education	44(51.8%)	41(48.2%)	85
Environmental Health Science	22(52.4%)	20(47.6%)	42
Epidemiology and Medical Statistics	40(59.7%)	27(40.3%)	67
Preventive Medicine and Primary	16(61.5%)	10(38.5%)	26
Institute of Child Health	7(31.8%)	15(68.2%)	22
Health Policy and Management	17(47.2%)	19(52.8%)	36
Human Nutrition	54(48.2%)	58(51.8%)	112
	200(51.3%)	190(48.7%)	390

$\chi^2 = 7.019;$

df= 6;

p=0.319

4.6.2 Null Hypothesis Two

There is no significant relationship between the socio-demographic characteristics (Sex and department) of the respondents and their perception of handkerchief as a fomite

The result, as shown on the table below reveals that there is a significant relationship between the Sex of the respondents ($X^2= 5.222$, $p=0.023$) and perception of handkerchief as a fomite while there is no significant Relationship between Department of the respondent and their perception of handkerchief as a fomite

Table 4.7.1: Relationship between Sex and Respondents' Perception of handkerchief as a fomite

Sex	Perception Category		Total
	Low	High	
Male	43(29.3%)	104(70.7%)	147
Female	99(40.7%)	144(59.3%)	243
Total	200(51.3%)	190(48.7%)	390

$X^2 = 5.222$; $df = 1$; $p = 0.023$

Table 4.7.2: Relationship between Course of study and Perception of respondents to handkerchief as a fomite

Department	Perception Category		Total
	Poor	Good	
Health Promotion And Education	31(36.5%)	54(63.5%)	85
Environmental Health Science	14(33.3%)	28(66.7%)	42
Epidemiology and Medical Statistics	23(34.3%)	44(65.7%)	67
Preventive Medicine and Primary	7(26.9%)	19(73.1%)	26
Institute of Child Health	7(31.8%)	15(68.2%)	22
Health Policy and Management	13(36.1%)	23(63.9%)	36
Human Nutrition	47(41.9%)	65(58.1%)	112
	142(36.4%)	248(63.6%)	390

$X^2 = 3.002$, $df = 6$, $p = 0.809$

4.6.3 Null Hypothesis Three

There is no significant relationship between the respondents' socio-demographic characteristics (Sex and department) and their perceived health benefits of handkerchief.

From the table as shown below, Chi square test was used to determine this. There is no significant relationship between all the socio-demographic variables and the perceived health benefit of handkerchief.

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Table 4.8.1: Relationship between Sex and Perception of respondents to handkerchief as a fomite.

Sex	Perception Category		Total
	Low	High	
Male	52(35.4%)	95(64.6%)	147
Female	107(44%)	136(56%)	243
Total	159(40.8%)	231(59.2%)	390

$\chi^2 = 2.844$; $df = 1$; $p = 0.111$

Table 4.8.2: Relationship between Course of study and respondents' Perceived health benefit of handkerchief

Department	Perception Category		Total
	Poor	Good	
Health Promotion And Education	26(30.6%)	59(69.4%)	85
Environmental Health Science	15(35.7%)	27(64.3%)	42
Epidemiology and Medical Statistics	36(53.7%)	31(46.3%)	67
Preventive Medicine and Primary	9(34.6%)	19(65.4%)	26
Institute of Child Health	8(36.4%)	14(63.6%)	22
Health Policy and Management	16(44.4%)	20(55.6%)	36
Human Nutrition	49(43.8%)	63(56.2%)	112
	159(40.8%)	231(59.2%)	390

$X^2 = 9.953$, $df = 6$, $p = 0.127$

4.6.4 Null Hypothesis Four

There is no relationship between the respondents' knowledge and their perception of handkerchief as a fomite.

The table below shows there is no significant relationship between the Knowledge and the perception of handkerchief of the respondents.

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Table 4.9: Relationship between Knowledge and Perception of respondents to handkerchief as a fomite

Sex	Knowledge Category		Total
	Poor	Good	
Male	78(39%)	122(61%)	200
Female	64(33.7%)	126(66.3%)	190
Total	142(36.4%)	248(63.6%)	390

$\chi^2 = 1.189$; $df = 1$; $p = 0.294$

CHAPTER FIVE

5.0 DISCUSSION, CONCLUSION AND RECOMMENDATIONS

This chapter is organized into six subsections, which are Socio-demographic characteristics of respondents, knowledge of use of handkerchief, Use of handkerchief, perception of handkerchief as a fomite, Perceived health benefits of handkerchief, conclusion and recommendations. The important aspects of Knowledge, use, perceived health benefits and perception of handkerchief as a fomite were made evident. The study found out that the rate of handkerchief use was quite high, just one in six people does not use a handkerchief. The overall Knowledge score of the use of handkerchief among the public health students was a bit poor. The general perception of handkerchief as a fomite among the students was high with majority agreeing that handkerchief can serve as a vehicle for the spread of infectious diseases. The general perceived health importance of handkerchief was also high.

5.1 Knowledge of the use of handkerchief

The findings from this study revealed that the respondents' general knowledge of the use of handkerchief was slightly poor, even though most of the students use handkerchief. This shows that the use of something at times does not really translate into good knowledge of that thing.

Similarly, the knowledge of the respondents concerning the duration of use of handkerchief was poor. Using a handkerchief for many days without washing can be very dangerous for the health of such an individual because when it traps germs or pathogens, it becomes a breeding place for these microorganisms. This agrees with the study done by South Australian Health, 2014.

The findings show that there is no significant relationship between the knowledge of use of handkerchief and the perception of handkerchief as a fomite, therefore the null hypothesis is failed to reject. This shows that knowledge of handkerchief use does not really affect or have a bearing on the students' perception of handkerchief as a fomite. However, one would expect that a person's knowledge about an issue should affect his or her thinking towards that issue. The poor knowledge level discovered by this study is a wakeup call to everyone that more effort is needed in providing adequate knowledge and information to the teeming youths in the country on the use of handkerchief. The fact that this study was conducted in a tertiary institution where

students are expected to be more knowledgeable and are aware of the danger associated with improper use of handkerchief make the case more worrisome.

The study shows that there is no significant relationship between the department and knowledge of use of handkerchief of the respondents. This reveals that the department of the student does not really affect their knowledge of the use of handkerchief.

5.2 Use of Handkerchief

The study found out that majority of the students use handkerchief. It shows that in every six students, only one does not use a handkerchief. For those that use it, it is belief that handkerchief is more hygienic than tissue paper. This actually boils down to preference which contradicts a study by ETIA, 2013, which showed that disposable tissue is more hygienic than handkerchief because disposable tissues contain significantly less bacteria than handkerchief.

The preference of the use of white colour handkerchiefs by majority of the students might be because, it shows or reveals to the owner the state of dirtiness or contamination of the handkerchief.

The study also found out that majorly, the choice of fabric of the handkerchief used by the respondents was cotton. This may be due to the nature of the fabric being able to absorb liquid and clean effectively as compared to other fabrics like silk for example, which absorbing properties is very poor and cannot clean effectively well. In addition, the study found out that majority of the students is willing to recommend the use of handkerchief to other people that might not be using it. This may be because they have tried it, and have seen some effectiveness in it usage and how hygienic it is.

5.3 Perception of handkerchief as a Fomite

Despite the fact that the students' knowledge of the use of handkerchief is slightly poor, their perception of handkerchief as a fomite is generally high. Majority agreed that a handkerchief can serve as a vehicle for transmission of disease. This is consistent with the findings of Reynold et al, 2005 which pointed out that fomite can become contaminated with pathogenic microorganism and serves as vehicle in disease transmission. This could be a reflection of their academic standard which enhances their perception of handkerchief as a fomite.

Another important result from this study is the possible transmission of pathogens when a handkerchief comes in contact with a contaminated surface. Majority says there will be a transmission of the pathogens from the contaminated surface onto the handkerchief if they are brought together. This statement corroborates the findings of Goldmann, 2000. The respondents' perception about the statement may be due to the fact that they might have studied about this and know that organism can be transmitted from one material to another when they come into close contact. Majority of the students agreed that handkerchief can be contaminated with infectious diseases when it comes in contact with body fluid. Their perception about this is that they know that blood, vomit, and feces may contain germs that can cause serious infection. For example their previous awareness of HIV in infected blood, and also the most common killer disease called Ebola can be contacted through contact with infected person. This finding also agrees with the findings of Boone and Gerba, 2007; that one of the ways fomites can be contaminated with infectious disease is contact with body fluid.

The study shows that the department of respondents and their perception of handkerchief as a fomite are not significantly related. This means, the department of study that a student belongs does not really affect their perception of handkerchief as a fomite.

5.4 Perceived Health Importance of Handkerchief

This study finds out that more than half (59.2%) of the students have high perceptions on the health importance of handkerchief. This means that the general perception of the respondents is high concerning the health benefit associated with the use of handkerchief. This may actually be associated with the status of the students. They are all public health students of the institution and they might have been taught, or even studied the subject matter or something similar to it for themselves prior to the time of the study.

This findings show that three in every four students says handkerchief can help prevents the spread of some infectious diseases that causes illness like flu. This gives credence to the findings of Main and Emily (2013), that handkerchief can help prevents the spread of pathogenic organisms.

5.5 Implication for Health Promotion and Education

Health education as a tool for health promotion is critical for improving the health of populations and promotes health capital, and one of the basic principle on which health education is founded is the Knowledge Attitude and Practice principle (KAP). The KAP principle holds that knowledge to a large extent determines attitude and perception towards the utilization of something which will subsequently transform into adoption of appropriate behavior to avoid risk associated with usage. In this case, the knowledge would determine their attitude and perception towards the utilization of handkerchief which will subsequently transform into adoption of appropriate behavior to avoid risk associated with usage. Therefore, their level of knowledge of use of handkerchief can be raised using appropriate health education method. One effective intervention that can be use is the peer education, since young minds are known to be greatly influenced by their peers.

The Department of Health Promotion and Education of the Faculty of Public Health, University of Ibadan in conjunction with private organizations and NGOs interested in respiratory and other related health issue such as gastrointestinal infections can also make use of the developed curriculum to organize workshops and seminars for students of various tertiary institutions. Facilitators for such intervention will include Health Educators, Health workers, Peer educators from amongst the institutions. The expected outcome from such programme will be empowerment and capacity building of students to have the necessary information required for them to make proper use of handkerchief.

Finally, the use of appropriate mass education methods will also go a long way in reinforcing knowledge of the proper use of handkerchief among young people as well as create an urgent need for adoption of practices that will reduce the prevalence of disease associated with the improper use of handkerchief. This can be achieved by the collaborative effort of the Health and Education sectors and the general public. This will involve the use of various channels of communication that can capture the attention of students such channels will include: the mass media, interpersonal communication, crusades and campaigns as well as various internet driven social media like Facebook, twitter etc.

5.6 Conclusion

The study examined the knowledge, Use and perception of handkerchief as a fomite among the student of Public Health University of Ibadan.

It was found that the general knowledge of the respondents' use of handkerchief was poor. This evidence on poor knowledge shows that there is a great need for widespread of information on the proper use of handkerchief. This is important because of the enormous influence knowledge would have on risk associated with improper use of handkerchief. The female respondents have proper knowledge of the use of handkerchief as compare to their male counterpart.

Most of the study participants used one handkerchief per day and their use of handkerchief is meant for different purposes depending on the individual. Majority prefer cotton made handkerchief because of it cleansing property. They do not share their handkerchief with another person, and prefer the use of handkerchief to tissue paper because they believe it is more hygienic and safe to use.

The respondents' general perception of handkerchief as a fomite was shown to be high. Their perception of handkerchief being able to spread, gets contaminated by and also serves as a reservoir for pathogens that are harmful to human health if handle improperly is well known. Also, they perceived the use of handkerchief to be highly beneficial and important in that it can be used to prevent the inhalation of harmful substances that cause infection to the body and some other related diseases that affect man.

In the light of these findings, recommendation were made, which could be adopted and utilized by appropriate stakeholders.

5.7 Recommendations

1. The findings of this study show that school students' knowledge on the proper use of handkerchief is a bit low. The school authority needs to organize periodic seminars and workshops to provide students with necessary information on the proper use of handkerchief. Such information should include the health hazards associated with improper use of handkerchief. This can also be extended to the general public or community around the school environment for wider spread of information.

2. Also, findings in this study show that almost all of the study participants use handkerchief. Their poor knowledge show that most of them do not really know how to maintain or use it properly hence, can have a negative impact on their health. Therefore, mass education of schools and the public through the use of various Behavioural Change Communication methods should be adopted to raise public consciousness on the correct practices in the usage of handkerchief.
3. The quality of a handkerchief in terms of its texture can determine the cleansing property of the handkerchief, therefore, advocacy can also be done to promote public policies that will encourage textile industries to produce the right type of handkerchiefs at affordable prices.
4. Rigorous awareness campaign by health organisations and schools on handkerchief as a fomite should be created through various means of communication like radio, television, posters etc. in order for the general public to know and be aware of the dangers that are involved or associated with improper use of handkerchief.

REFERENCES

- Abad, F. X., Villena, C., Guix, S. Caballero, S., Pinto, R.M and A. Bosch. (2001). Potential role of fomites in vehicular transmission of human astroviruses. *Appl. Environ. Microbiol.*67:3904-3907
- Aiello, A. E., Coulborn, R. M., Perez, V & Larson, E. L. (2008). Effect of hand hygiene on infectious disease risk in the community setting: a meta-analysis. *American Journal of Public Health*; 98(8):1372-1381
- Allison, E. & Aiello. (2012). Infection Prevention in University setting. www.torkusa.com
- Anais D. (2012). Hanky, Anyone?. The urban Homestead Journal. www.urbanhomestead.org/journal/2012/01/19/hanky-anyone
- Ansari, S. A., Springthorpe, V. S., Sattar, S. A., Rivard, S. & Rahman, M. (1991). Potential role of hands in the spread of respiratory viral infections-studies with human parainfluenza 3 and rhinovirus 14. *Journal of Clinical Microbiology*, 29:2115–2119
- Barker, J., Stevens, D. & Bloomfield, S. F. (2001). Spread and prevention of some common viral infections in community facilities and domestic homes. *Journal of Applied Microbiology* 91:7–21
- Barker, J. D., Vipond, I. B. and Bloomfield, S. F (2004). Effects of cleaning and disinfection in reducing the spread of norovirus contamination via environmental surfaces. *J.Hosp. Infect.* 58:42-49. Medline
- Bidawid, S., Farber, J. M. and Sattar, S. A (2000). Contamination of food handlers: experiments on hepatitis A virus transfer to food and its interruption. *Appl. Environ. Microbiol.* 66:2759-2763
- Bloomfield, S. F., Exner, M., Signorelli, C., Kumar, J. N. & Elizabeth, A. S. (2011).The infection risks associated with clothing and household linens in home and everyday life settings, and the role of laundry published on: <http://www.ifh-homehygiene.org/IntegratedCRD.nsf/eb85eb9d8ecd365280257545005e8966/d0e3b0f361079f1780>

- Boone, S. A. & Gerba, C. P. (2005). The occurrence of influenza A virus on household and day care center fomites. *Journal of Infectious Disease*; 51(2):103-109.
- Boone, S. A. & Gerba, C. P. (2007). Significance of fomites in the spread of respiratory and enteric viral disease. *Applied Environmental Microbiology*, 73(6):1687-1696
- Barker, J. D., Stevens. & Bloomfield, S. F. (2001). Spread and prevention of some common viral infections in community facilities and domestic homes. *Journal of Applied Microbiology* 91:7-21.
- Braun-Ronsdorf, M. (1967). The History of the Handkerchief. Leigh-on-Sea, England: F. Lewis Publishers, Limited. Pg 11-24
- Couch, R. B. & Baron, S. (1995). Orthomyxoviruses, University of Texas Medical Branch, Galveston, Medical microbiology p122. <http://www.gsbs.utmb.edu/microbook/ch058.htm>
- Dowell, S. F., Simmerman, J. M., Erdman, D. D., Juinn-Shyan, J. W., Chaovavanich, A., Javadi, M., Yang, J. Y., Anderson, L. J., Tong, S. & Ho, M. S. (2004). Severe acute respiratory syndrome coronavirus on hospital surfaces. *Clinical Infectious Disease* 39:652-657.qw
- Eccles, R. (2005). "Understanding the symptoms of the common cold and influenza". *Lancet Infectious Disease*, 5(11):718–25.
- England, B. L., Gerba, C. P. & Goyal, S. M. (1982). Detection of viruses on fomites. *Methods in environmental virology*. Marcel Dekker Inc; New York. Pp. 179-220.
- European Tissue Paper Industry Association (2013). "Tissue at home." European tissue symposium. www.europeantissue.com/hygiene/tissue-hugiene/m. Accessed June, 27, 2014
- Gerba, C. P. & Goyal, S. M. (1982). *Methods in environmental virology: Detection of viruses on fomites*. Marcel Dekker Inc; England. Pp. 179–220.
- Goldmann, D. (2000). Transmission of viral respiratory infections in the home. *Paediatric Infectious Disease Journal*, 19:S97-S102

Gwaltney, J. M. & Hendley, J. O. (1982). Transmission of experimental rhinovirus infection by contaminated surfaces. *American Journal of Epidemiology*, 116:828-833.

Heikkinen, T. & Jrvinen, A. (2003). The common cold. *Lancet* 361: 51-59.

Hendley JO and Gwaltney JM (1988). Mechanisms of transmission of rhinovirus infection. *epidemiol. Rev.* 10:242-258.

Hota, B. (2004). Contamination, disinfection, and cross-colonization: are hospital surfaces reservoirs for nosocomial infection? *Clinical Infectious Disease*, 39:1182-1189

Information and hygiene Advice sheet. (2008). Cold, flu and other respiratory infections in the home, www.ifh-homehygiene.org accessed on July 30th, 2014

International Scientific Forum on Home Hygiene. 2002. The infection potential in the domestic setting and the role of hygiene practice in reducing infection. <http://www.ifh-homehygiene.org/2003/2library/2lbr00.asp#IFH>

Jefferson, T., Del Mar, C., Dooley, L., Ferroni, E., AlAnsary, L. A., Bawazeer, G. A., Van Drie, M. L., Foxlee, R. & Rivetti, A. (2009). Physical Interventions to Interrupt or Reduce the Spread of Respiratory Viruses: Systematic Review. *British Medical Journal*, 339: b3675

Jefferson, T., Foxlee, R. & Del Mar, C. (2007). Physical interventions to interrupt or reduce the spread of respiratory viruses: systematic review. *British Medical Journal*; 336:77-80.

Keswick BH, Pickering LK, DuPont HL, and Woodward WE (1983). Survival and detection of rotaviruses on environmental surfaces in day care centers. *Appl. Environ. Microbiol.* 46:813-816

Koopmans M, von Bonsdorff CH, Vinje J, de Medici D and Monroe S (2002). Foodborne viruses. *FEMS Microbiol. Rev.* 26:187-205. Medline

Kramer A, Schwebke I and Kampf G (2006). How long do nosocomial pathogens persist on inanimate surfaces? A systematic review. *BMC Infectious Disease* 6: 130

Lai, A. C., Poon, C. K. & Cheung, A. C. (2012). Effectiveness of Facemasks to Reduce Exposure Hazards for Airborne Infections among General Populations. *J. R. Soc. Interface*, 9: 938–948.

Lester & Katherine Morris (1954). *Accessories of Dress*. Peoria, IL: Chas A. Bennett Co., Inc.

LJ & Miller, S. E. (2001). Outbreaks of acute gastroenteritis associated with Norwalk-like viruses in campus settings. *Journal of American College of Health*, 50(2):57-66

Lo, J. Y., Tsang, T. H., Leung, Y. H., Yeung, E. Y., Wu, T. & Lim, W. .W (2005). Respiratory infections during SARS outbreak, Hong Kong, 2003. *Emerging Infectious Disease*, 11:1738-41.

Main. & Emily. (2013). "Tissues vs. Hankies: Which is Better?" Rodale News. Rodale, <<http://www.rodale.com/handkerchief-and-recycled-tissue?page=0,1>

Management of Infectious Disease in Schools (2013). *Infection*. How do infection spread Pg 6

McElhaney, J. (2003). Epidemiology in elderly people. *Influenza Information News* 16:3

Moe, C. L., Christmas, W. A. & Echols, L. J. (2008). Norovirus outbreaks on three college campuses - California, Michigan, and Wisconsin, 2008. *MMWR Morb Mortal Wkly Rep*; 58(39):1095-1100,

Moe, C. L., Christmas, W. A., Echols, L. J. & Miller, S. E. (2001). Outbreaks of acute gastroenteritis associated with Norwalk-like viruses in campus settings. *Journal of American College of Health*, 50(2):57-66.

Monto, A. S. (2002). Epidemiology of viral respiratory infections. *American Journal of Medicine*, 112: 4-12.

Morens DM and Rash VM (1995). Lessons from a nursing home outbreak of influenza A. *Infect. Control Hosp. Epidemiol.*16:275-280.

National Institute of Allergy and Infectious Diseases. (2005). [2] 26 October 2005. Retrieved on 3 October 2006

Park, K. (2007) Park's textbook of preventive and social medicine. Nineteenth edition Publisher M/s Banarsidas Bhanot 1167, Prem Nagar, Jabalpur, 482001 India p 149-165

Paulson, D. S. (2005). The transmission of surrogate Norwalk virus—from inanimate surfaces to gloved hands: is it a threat? *Food Prot. Trends* 25:450-454

Phillip Allan (2014). Update; much ado about handkerchief: pg. 108,

Reiling J (2000). Dissemination of bacteria from the mouth during speaking, coughing and otherwise. *JAMA* 284:156.

Reynolds, K. A., Watts, P., Boone, S. A. & Gerba, C. P. (2005). Occurrence of bacteria and biochemical biomarkers on public surfaces. *International Journal of Environmental Health Research*, 15:225–234.

Ronald, E. & Olaf, W (2009). Common cold. Basel: Birkhauser. Pg 3

Rosenstock, I. (1974). Historical Origins of the Health Belief Model. *Health Education Monographs*. Vol. 2 No. 4.

Rusin, P., Maxwell, S. & Gerba, C. P. (2002). Comparative surface to hand and finger to mouth transfer efficiency of gram-positive, gram-negative bacteria and phage. *Journal of Applied Microbiology*, 93:585-592

Sampathkumar P, Temesgen Z, Smith TF and Thompson RL (2003). SARS: epidemiology, clinical presentation, management and infection control measures. *Mayo Clinic Proc.* 78:882-890.

South Australia Health (2014). Health care associated infections Government of South Australia www.health.sa.gov.au/infectioncontrol. Accessed on July 27th, 2014.

Sattar, S. A. (2001). Survival of microorganisms on animate and inanimate surfaces and their disinfection, p. 195–205. *In Shans* www.geocities.ws/./Handker.pdf

Shashank V. P. (2012). Effective uses of a handkerchief; conventional uses of handkerchief. www.geocities.ws/mocking/handker. Accessed on the 23rd July, 2014)

Sharp, T. W., Hyams, K. C. & Watts, D. (1995). Epidemiology of Norwalk virus during an outbreak of acute gastroenteritis aboard a US aircraft carrier. *Journal of Medical Virology*, 45(1):61-67,

- Simmerman, J. M., Suntarattiwong, P. & Levy, J. (2009). Influenza virus contamination of common household surfaces during the 2009 influenza A (H1N1) pandemic in Bangkok, Thailand: implications for contact transmission. *Clinical Infectious Disease*, 51(9):1053-1061
- Soule H, Genoulaz O, Gratacap-Cavalier B, Mallaret MR, Morand P, Francois P, Luu Duc Bin D, Charvier A, Bost-Bru C and Seigneurin JM (1999). Monitoring rotavirus environmental contamination in a paediatric unit using polymerase chain reaction. *Infect. Control Hosp. Epidemiol.* 20:432-434.
- Sun, Y., Wang, Z., Zhang, Y. & Sundell, J. (2001). In China, students in crowded dormitories with a low ventilation rate have more common colds: evidence for airborne transmission. *PLoS One*, 6 (11):e27140
- Tammelin, A., Domicel, P., Hambraeus, A. & Ståhle, E. (2000) Dispersal of methicillin-resistant *Staphylococcus epidermidis* by staff in an operating suite for thoracic and cardiovascular surgery: relation to skin carriage and clothing. *Journal of Hospital Infection*; 44:119-26
- Tang, J. W., Noakes, C. J. & Nielsen, P. V. (2007). Observing and quantifying airflows in the infection control of aerosol- and airborne-transmitted diseases: an overview of approaches. *Journal of Hospital Infections*, (3):213-222,
- Tarabbo, M., Lapa, D. & Castilletti, C. (2009). Retrospective investigation of an influenza A/H1N1pdm outbreak in an Italian military ship cruising in the Mediterranean Sea, May-September 2009. *PLoS One*, 6(1):e15933
- Tellier R. (2009). Aerosol transmission of influenza A virus: a review of new studies. *J R Soc Interfac*, 6 (Suppl. 6):S783-90.
- Tones, K. & Green, J. (2004). Health Promotion. Planning and Strategies. London: Sage Publications
- Tong M. J., El-Farra N.S, and Grew M.I(1995). Clinical manifestations of hepatitis A: recent experience in a community teaching hospital. *J. Infect. Dis.* 171(Suppl. 1):S15-S18

Tulve, N. S., Suggs J.C, McCurdy T., Elaine A., Hubal C., and Moya J.(2002). Frequency of mouthing behavior in young children. *J. Exp.Anal. Environ. Epidemiol.* 12:259-264.

Ustun, A. & Covalan, C. (2006). Almost a quarter of all disease caused by environmental exposure. WHO, Geneva. <http://www.who.int/mediacentre/news/releases/2006/pr32/en/>.

Van der Sande, M., Teunis, P. & Sabel, R. (2008). Professional and Home-Made Face Masks Reduce Exposure to Respiratory Infections among the General Population. *PLoS ONE* 3: e2618, doi: 10.1371/journal.pone.0002618.

White, C., Kolble, R., Carlson, R. & Lipson, N. (2005). The impact of a health campaign on hand hygiene and upper respiratory illness among college students living in residence halls. *Journal of American College of Health*; 53(4):175-181

APPENDIX

QUESTIONNAIRE

I am a Masters of Public Health Student from the Department of Health Promotion and Education, College of Medicine University of Ibadan. I am carrying out a study titled “**Knowledge, Perception and Use of Handkerchief as a Fomite among Public Health Students in the University of Ibadan, Nigeria**”.

It is expected that the outcome of this study may provide the basis for increase health education information on use of handkerchief among students. This will also enable us to know the modalities to further educating the public on the proper use of handkerchief and its health importance. You are therefore invited to participate in this research, which involves providing answers to the questions below. Information provided will be kept confidential and used for research purposes only.

Also, the research is risk free and participation is entirely voluntary.

Thanks for your cooperation.

SECTION A: SOCIO-DEMOGRAPHIC INFORMATION

Instruction: Please, mark [✓] in the boxes provided (as appropriate)

1. Gender 1. Male [] 2. Female []
2. Age in years (Age as at last birthday)years
3. Department.....
4. Level of study 1. Year one [] 2. Year two [] 3. Others (Specify).....
5. Residence 1. Campus [] 2. Off-campus []
6. Religion 1. Christianity [] 2. Islam [] 3. African Tradition [] 4. Others (specify).....
7. Marital status 1. Single [] 2. Married [] 3. Cohabiting [] 4. Others (specify).....
8. Ethnicity 1. Yoruba [] 2. Igbo [] 3. Hausa [] 4. Others (specify).....
9. Do you use a handkerchief? 1. Yes [] 2. No []
10. Do you have one now? 1. Yes [] 2. No []

SECTION B: KNOWLEDGE OF USE OF HANDKERCHIEF

- 11. What should be the colour of a standard handkerchief to be used as a preventive tool?
.....
- 12. Why is this colour preferred?
- 13. What should be the quality of the fabric of a standard handkerchief?
- 14. Where should the handkerchief be kept as part of your dressing if you use one?
.....
- 15. Why should you keep it within this place?
- 16. How should you wash a handkerchief; separate or with other fabrics?
- 17. How should you treat a handkerchief after washing and drying?
- 18. How long are you supposed to use a handkerchief before washing?
- 19. State one main preventive health reasons for the use of handkerchief
-

SECTION C: USE OF HANDKERCHIEF

- 20. How many handkerchiefs do you use per day?
- 21. If more than one, why do you use more than one?
-
- 22. What material is your handkerchief made of?
- 23. What do you use handkerchief for?
- 24. What is the colour of your handkerchief?
- 25. Do you share your handkerchief with another person?
- 26. Can you recommend the use of handkerchief to others?
- 27. Do you prefer the use of handkerchief to tissue paper?
- 28. If yes, Why? (State as many reasons as possible).....
-
-
-

SECTION D: PERCEPTION OF HANDKERCHIEF AS A FOMITE

S/N	Statement	Agree	Disagree
29	Handkerchief can serve as a vehicle for the spread of pathogenic organisms.		
30	Pathogenic organisms cannot be transmitted by handkerchief		
31	Pathogenic organisms remain in an infected handkerchief for several hours		
32	Pathogenic organism can be transmitted to a handkerchief when it comes in contact with a contaminated surface		
33	By using a contaminated handkerchief to wipe your nose/eyes, you cannot be infected.		
34	Once a (fomite) handkerchief is contaminated, the transfer of pathogenic organism can readily occur between two inanimate and animate object		
35	An individual can pick up pathogenic organism if he/she touches a contaminated handkerchief surface		
36	Handkerchief can be contaminated with infectious diseases through contact with body fluid		
37	When handkerchief touches a body part, it can be contaminated with infectious disease.		
38	Other fomites can contaminate a handkerchief with infectious disease when they come in contact.		

SECTION E: PERCEIVED HEALTH BENEFITS OF HANDKERCHIEF

S/N	Statement	Agree	Disagree
39	A handkerchief does not have any health use		
40	A handkerchief can be used as a device to protects against inhalation of harmful substances		
41	A handkerchief can help to prevent the spread of diseases		
42	I cannot contact infection if I share my handkerchief with someone that has infection.		
43	Handkerchief can only prevent disease if a chemical is sprayed on it		
44	Handkerchiefs may help prevent illness by providing a more substantial barrier between an individual with cold and those in close contact.		