Addis Ababa University
Faculty of Informatics
Health Informatics Program

Assessment of Knowledge, Attitude and Utilization of Information Communication Technology among Medical students and Health care providers at Tikur Anbessa Specialized Hospital

By

Melisachew Adane (B.Sc)

July, 2009

Addis Ababa, Ethiopia

Addis Ababa University
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Investigator: - Melisachew Adane (B. Sc in Public Health)

Advisors: Lemma Lessa (M.Sc)
Solomon Shiferaw (MD, MPH)

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Approved by the Examining Board

_____ _____

Chairman, Department Graduate Committee

Lemma Lessa _____

Advisor

Dr. Solomon Shiferaw _____

Advisor

_____ _____

Examiner

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Dedication

To all Health care providers in Ethiopia working in poor infrastructure set up to improve the health of their community.

Acronyms

AAU	Addis Ababa University
AOR	Adjusted Odds Ratio
CHIME:	Center for Health Informatics and Multi professional Education
CI	Confidence Interval
COR	Crude Odds Ratio
FMoH:	Federal Ministry of Health
HCP	Health Care Provider
HMIS	Health Management Information System
ICT:	Information and Communication Technology
IT:	Information Technology
MD:	Medical Doctor
MF	Medical Faculty
MUCHS:	Muhimbi University College of Health Science
PASDEP:	Plan for Accelerated and Sustained Development to End Poverty
PC:	Personal Computer
PG:	Postgraduate
PPT	Powerpoint
SPSS:	Statistical Package for Social Science
UG:	Undergraduate
UK:	United Kingdom

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Abstract

Background: The advancement in Information Communication Technology (ICT) provides greater ease of access and use to exploit the benefits of computing for medical education as well as quality health service delivery. However, there is no adequate information on the level of knowledge and utilization patterns of ICT among medical students and health care providers in Ethiopia.

Objective: To assess the knowledge, attitude and utilization of ICT among students and health care providers in AAU, Medical Faculty and Tikur Anbessa Specialized Hospital, Addis Ababa.

Methods: A cross sectional survey was conducted in AAU, MF and Tikur Anbessa Specialized hospital from February to March 2009, a total of 403 study participants were randomly selected from undergraduates, residents and health care providers based on their population size proportionally. The quantitative data were collected using self administered pretested questionnaire. The study was complimented with in-depth interview. Data were initially entered into EPi-6 dos version and exported to SPSS version 15.0 for analysis.

Result: A total of 334 students and 59 HCPs participated in the study and about 25% of the respondents had satisfactory knowledge. Around 52% of the respondents had at least one computer at home and 74.8% of study subjects had Internet access mostly from Internet café (46.6%). Among study participants who had Internet access, 89.3% were users though 90.1% of them using it for e-mail service. About 83.2% of study participants had positive attitude towards ICT. The utilization rate of computer was 32.6% for all respondents. Computer possession [OR (95%CI) = 5.67(2.68, 11.99)], having computer training [OR (95%CI) = 2.26(1.12, 4.55)], knowledge on ICT [OR (95%CI) = 2.52(1.31, 4.84)], being intern [OR (95%CI) = 5.01(1.71,14.69)] and resident [OR (95%CI) = 6.84(1.46, 31.99)] had significant difference in level of utilization among students in Addis Ababa University, Medical Faculty.

Conclusions and recommendations: The study indicated that students and HCPs had low knowledge level and poor utilization status of ICT for academic purpose and service delivery needs. The findings indicate the need for improving the existing ICT course in the curriculum to be more skill oriented and also formal in-service ICT related trainings for the health care providers. Further, it is recommended that the medical faculty as well as MOH should consider improving the ICT facilities for students and health care providers with the aim of achieving universal access.

1. Introduction

Developments in information and communication technology occur at an astonishing rate. This has had huge implications for medical practice throughout the world (1). Medicine has always been an ‘‘information-intensive’’ occupation, and the penetration of information technology into practice and education is generally welcomed. The advances in technology provide greater ease of access and use to exploit the benefits of computing for medical education as well as quality health service delivery purposes (1, 2). This trend of increased use of computers in medical practice makes it important for medical school graduates to develop and enhance computer skills for their future practices (3).

Although the importance of computer literacy in today’s rapidly changing environment cannot be denied, institutional provision of opportunities and inclusion of such skills into their curriculum for medical students to acquire the necessary technical skills has been comparatively slow and inconsistent (2, 4). One of the basic concerns with this regard is that the spread of information and communication technologies in developed countries is leaving the rest of the world behind. In most of the developing countries including Ethiopia many programs have concentrated on increasing the number and spread of ICT infrastructures without adequate effort on the capacity building. These may create a gap in ability and utilization of ICT and also reduces the impact of Information technology use, measured by financial, economic and clinical returns. In other words, equipment alone is useless unless people are able to use it effectively and informed of the potential benefits of its use (1).

The Government of Ethiopia believes that exploiting information technology is central to promote growth and reduce poverty. One of the ICT strategies in Plan for Accelerated and Sustained Development to End Poverty (PASDEP) is mainstreaming the use of ICT in all

sectors of the economy. A central part of this strategy is applying the principle of modern ICT to the delivery of services and administration of government, to improve effectiveness and reduce costs. Accordingly, health is one of the main service delivery sectors that need mainstreaming the ICT to provide quality health care delivery. Equipping the health professionals with appropriate knowledge and skill of ICT during their stay in the medical school is vital to implement the information technology in the health sector as to the national strategy (7). However, the reality in the ground is different according to the ICT penetration and usage base line study conducted in Ethiopia that indicated only 2% of the sampled health professionals have formal college or university ICT training**.** This may be an evidence to say much should be done in the medical institutions in the area of increasing ICT skills for the prospect graduates as well as the existing health care providers. The skill and utilization patterns of ICT among medical students is not known and to my knowledge there is no published reports on the knowledge and utilization patterns of ICT among medical students in Ethiopia particular in Tikur Anbessa Hospital. Hence, this assessment will identify factors contributing to the poor ICT knowledge, skill and utilization in the medical set up (6).

1.1. Rationale of the Study

It is already known that computers influence every sphere of human activity and bring many changes in medical education, healthcare and scientific research etc. Computers can perform a wide range of activities that save time and help health care providers to be engaged in other patient care activities. The availability of quality applications for medical education in both the basic and clinical sciences makes it feasible for an institution to incorporate such applications into the existing curriculum (3, 8). Accordingly, it is necessary to ensure the knowledge and utilization of ICT among those who deliver the service. Therefore this study is going to assess the knowledge of medical students on ICT and their utilization status and also the possible factors that influence using ICT for their academic purpose and service delivery needs. In line

with this, the findings will also provide baseline information for medical faculty and health facility administrators in planning ongoing computer training for medical students as well as health care providers currently working in the health facilities.

2. Literature Review

2.1. The role of ICT in Medical education

The emerging need of computer knowledge has made an impact in every field, including the medical world (9). Since the development of the computer and the evolution of the Internet, Information Technology (IT) has had a positive impact on health care delivery systems worldwide, particularly in the areas of disease control, diagnosis, patient management and teaching (10). In general, clinical practice has been tremendously improved by the technological interventions (11). As a result of this revolution, the application of ICT especially in the areas of information access, storage, retrieval, analysis and dissemination of information is becoming a routine activity in the health care system. This makes it almost mandatory for the healthcare professionals to be well versed with this technology in the developed world (11, 9).

Moreover computerization could resolve certain problems and derive benefits including reduction in clerical work required of professionals, reduction in printed forms, centralized patient care data, etc (8). The development of online databases plays a vital role in packing and delivery of medical research as the same time it allows medical professionals throughout the developed world immediate access to hundreds of e-journals at the touch of a button, a striking contrast to the plight of many of their colleagues in developing countries who are forced to search empty libraries (1, 5).

Rapid advancement in information technology and the increasing availability of electronic health information are revolutionizing health care systems worldwide. Innovations in technology have made portable electronic devices, network database applications, electronic medical records, and computer software programs increasingly integrated into many health care settings. These changes create the educational need for health care providers to become

proficient at appropriately using technology to deliver high quality health care services. However, the impact of ICT on medical practice in the developing world is not significant due to lack of awareness and access to computer (12).

2.2. Accessibility to ICT

The use of computer and Internet technology by health science students will result in more effective medical education, including teaching, medical examination, and diagnosis of disease. However, these gains will only occur when students have increased access to these technologies (13). One of the central factors identified for the skill of computer among physicians is the ownership of a personal computer. This is because it is associated with better information-handling knowledge and favorable perception of the computer-based record system (11).

Several studies in the accessibilities of IT among medical students and health workers showed a magnificent difference between the developed and developing world. In a survey of physicians across eleven North American, European and Asian countries in 1998, 80% of physicians were found to own a computer and 44% of these physicians had accessed the Internet and their predominant place of Internet access was in the home. In another survey of European Universities Skill in ICT of students and Staff (SEUSISS) project (2001-2002) the number of personal computer (PC) ownership at the start of studies varied from 54% (Abo, Finland) to 89% (Groningen, Netherlands). Recent studies have however shown remarkable improvements in these figures. But much is not reported in the literature about the level of Internet access amongst doctors and the use of electronic medical records of health facilities in Africa (11, 14).

A study conducted in Medical university of Vienna showed almost all students (94%) have access to a privately owned PC, which is either owned by the students themselves (74%) or shared with family members or roommates (20%). Only 5% rely primarily on public computer facilities. In the same study the great majority of students also have access to the Internet (4). Similarly a longitudinal study in Aarhus, Denmark showed among the total first year medical students, 71.7% indicate they had access to computer at home. In this study Internet access at home was also assessed and it was found to be increased from 20.4 to 62.9% in the study period and there was an even more pronounced increase in the use from any location, of Internet and e-mail (14). On the other hand in developing countries, the Internet is still only available to a minority of health professionals, and often it is not available at the point of care (15).

The access to computer of medical students in Africa is lagging behind when compared to the developed world. A study in the MUCHS, Tanzania showed the medical student to computer ratio is 100:1. It is too far behind when it is compared to 35:1 in Portugal, 9:1 in the UK and 5:1 in Norway. With regard to ownership of computer at home 76% of MUCHS students didn't have a computer at home. This figure is in stark contrast with the availability of computer at home which is 71.7% Aarhus, Denmark and 86% in California, USA (1, 14). Similarly a study in Ile Ife university teaching hospital, Nigeria showed only 26% of students owned a computer (10). Even if computer access is vital in acquiring skill of ICT, almost all of the studies conducted in Africa indicated that access to computer is very limited.

A base line study on ICT penetration and usage in Ethiopia indicated that 51% of health workers gain access to computers in their work place. Private computer centers are the second most important place (46%) and only 12% of the sampled health professionals had computer access at

home of which majority of them are from Addis Ababa. It should also be realized that access to printed materials is very much limited in the health facilities, especially outside of Addis Ababa. As information is critical in the operation of health professionals every effort should be made to improve access to computers and the Internet at the work place. Thus Health workers will constantly update themselves about new developments (in the area of treatment and nature of various diseases) with the help of computers and Internet (6).

Therefore providing students with computer access in addition to the theoretical training by placing computer stations in the library or by developing a dedicated computer laboratory space have been the most common solutions adopted by institutions to ensure the skill of medical students on ICT before they leave the campus. As a result of the aforementioned facts recently some medical schools have considered policies recommending that students acquire a PC for their medical education, or even requiring them to do so (3).

2.3. Knowledge and Attitude towards ICT

In this ICT era the need for medical students to be computer literate is no longer an issue for debate. Currently using computerized medical records, retrieving patient data at a distant and accessing medical journals and literature electronically is common. Hence, acquiring basic knowledge on computer and understanding the basics of Internet among physicians is crucial (16). However, several studies in the literature suggest many medical students feel that they lack computer skills and majority of them are interested in learning more about computers while attending medical school (17).

A study conducted in Punjab, India showed that majority (75%) of staff nurses had good computer knowledge and 21% had average computer knowledge in clinical care setting. All the

nurses had positive attitude towards computers (8). Another study from Chennal, India indicated that 42% of Undergraduate (UG) and 47% of Postgraduate (PG) medical students felt that working with computer gave them a lot of self-confidence. Concerning Knowledge 40% of all medical students did not have any knowledge of database and spreadsheet (9). Similarly the longitudinal study conducted in Aarhus, Denmark indicated that 86% of male and 76% of female students had positive attitude towards use of ICT resources as a supplement for their medical education (14). Contrary to this a study from Nigeria teaching hospital showed that from the total respondents only 19% and 40% of the medical students demonstrated a good knowledge on computers and had positive attitude towards IT respectively (10). The study from MUCHS, Tanzania indicated that only 52% of students felt that they understood the basic terminology and concepts of computing (1). Similarly a study from a resource poor setting showed that 60% of the students who were familiar with computers acquired their knowledge through self-learning efforts while 37.5% attended a formal training. Based on the ICT penetration base line survey conducted in Ethiopia the overall computer literacy among health professionals was 39% with no visible differences between Addis Ababa and regional towns. Personal effort is the main method (67%) of acquiring ICT skill, which is similar to other studies followed by short-term computer training (33%), formal College or university ICT training is reported by only 2% of the respondents (5, 6). These all facts in the literature indicate delivering computer courses at the medical institutions is neglected. More over majority of the literatures suggest the need for training of physicians in the use of computer in the medical education. To that end, determining the gap of medical students for acquiring computer skill in terms of training or accessibility should be assessed before starting any intervention (3).

2.4. Utilization of ICT

Clearly, medical students need to acquire computer and information management skills at the beginning of their medical education. As indicated in many literatures most of the latest reference materials are accessible electronically; this is also an assertion supported by a recent two-year survey at the University Of Illinois College Of Medicine at Rockford (2). In support of the above fact a study conducted in Austria in 2004 showed that 75% of university and high school students used a computer daily for different purpose especially for e-mail communication (94%), Internet for information research (97%) and use of word process is very common (82%), but students are less familiar with other program types (4). Majority of the studies conducted in the developed world showed the skill of students in using ICT is high which were showed by 84% of undergraduate students in Glasgow, UK, 95% undergraduate dental students in Oulu, Finland. There is also an encouraging trend of ICT utilization in some of the East and Central Asia countries like 94% and 95% of medical students in Malaysia and Saudi Arabia respectively use computers for their medical education (13, 18).

In spite of the limited studies conducted in the developing world especially in Africa, some of the studies showed that the skill and utilization of ICT among medical students as well as health care providers are very poor. In support of the above idea a study from Nigeria teaching hospital on Computer and Internet use by first year clinical and nursing students showed that, only 43% of students could use the computer. Odusanya and Bamgbala in the same institution found that 80% of the medical and dental students in their final year had used the computer; however, the use of software applications was poor, with computer games being the most frequently used (19%) followed by word processing software (18%). The Internet and email were used by 58%, but only 23% had used the Internet for medical research (11, 13). In similar context a study from Tanzania medical university college indicated that about 74% of medical

students never use a computer as part of any course either at school or university. Out of those who are using (25%) the median hours per week of computer use was 3.8 (2–10). At this time their computer skill was also measured and found to be very low. The method of measuring skill is adapted from the Center for Health Informatics and Multi professional Education (CHIME) in UK, students with an overall score of less than 10 are considered to have low skills and are offered peer mentoring training. Using this criterion, around 50% of the Tanzanian medical students would fall into the low skills category compared with 9% of first year UCL medical students in 2002. All these studies concluded that utilization of ICT was poor amongst the resource poor sub Saharan African countries (1, 10).

Similarly, in Ethiopia only 33% of the health workers use computers for various purposes. The single most important purpose of using computers is word processing and related activities (office tools) for 81% of the reporting respondents. Some 26% of the sample respondents use the Internet. As expected, e-mail is the most important reason for using the Internet (90%). The barriers identified for ICT utilization in the health sector during the base line survey on ICT penetration and usage in Ethiopia were Lack of necessary equipment (accessories) and absence of ICT strategic plan. In addressing the possible factors for ICT utilization the current ICT strategy of the country is encouraging especially in scale up of ICT infrastructures at all level of service delivering sectors. Hence the medical institutions should take this as a good opportunity to incorporate computer courses in their medical education then medical students may acquire appropriate skill for their future carrier (6, 7).

3. Objectives

3.1. General objective

- ✓ To assess the knowledge, attitude and utilization status of ICT among students and health care providers in AAU, Medical Faculty (MF) and Tikur Anbessa Specialized Hospital, Addis Ababa.

3.2. Specific objectives

- ✓ To assess knowledge of ICT among students and health care providers in AAU, MF and Tikur Anbessa Specialized Hospital
- ✓ To examine attitudes of students and health care providers towards ICT in AAU, MF and Tikur Anbessa Specialized Hospital.
- ✓ To measure the extent of computer and Internet use among students and health care providers in AAU, MF and Tikur Anbessa Specialized Hospital
- ✓ To identify factors affecting knowledge and utilization status regarding ICT among students in AAU, MF.

4. Methods and Materials

4.1. Study Design

The study was cross-sectional survey by design complimented with qualitative in-depth interview.

4.2. Study Area

The study was conducted at Tikur Anbessa Specialized Hospital in Addis Ababa. Tikur Anbessa is one of the tertiary level hospitals in the country that give medical, specialty and subspecialty training. The hospital provides service to patients referred from all over the country. The teaching staffs are also expected to conduct various research activities of national and international significance. In relative terms the hospital is equipped and facilitated with modern medical equipments and highly skilled medical professionals. Based on the government educational policy and the direction of the university, the medical faculty is providing undergraduate and postgraduate level training in various fields of studies. According to the data from the medical faculty registrar office in the 2007/2008 fiscal year the faculty provided training to 119 senior physicians/Medical doctors, 656 graduate study (both clinical and non clinical) students and 1570 undergraduate students (19).

4.3. Study Population

4.3.1. Source Population

All students and health care providers in the Faculty of Medicine including residents, medical doctors and nurses, either attending their medical education in the faculty or providing health care service in Tikur Anbessa Specialized Hospital during the study period, were the source population.

4.3.2. Sample Size

A single population proportion formula, [$n = (Z\ \alpha/_2)^2\ p\ (1\text{-}p)\ /\ d^2$], was used to estimate the sample size of respondents to be interviewed. Due to lack of previous studies showing the proportion of computer utilization and literacy among medical students in the medical institution of Ethiopia, the following assumptions have been made: a prevalence of 50% ICT utilization among medical students or health care providers was assumed to get maximum sample size (p = 0.5), level of significance to be 5% (α = 0.05), $Z\ \alpha/_2 = 1.96$ and absolute precision or margin of error to be 5% (d = 0.05). Computing with the above formula gives a total sample size of 384. An allowance of 5% was added to compensate for possible non respondents during the actual survey. Based on these assumptions, the total calculated sample size was 403.

4.3.3. Sampling Procedures

Quantitative Study

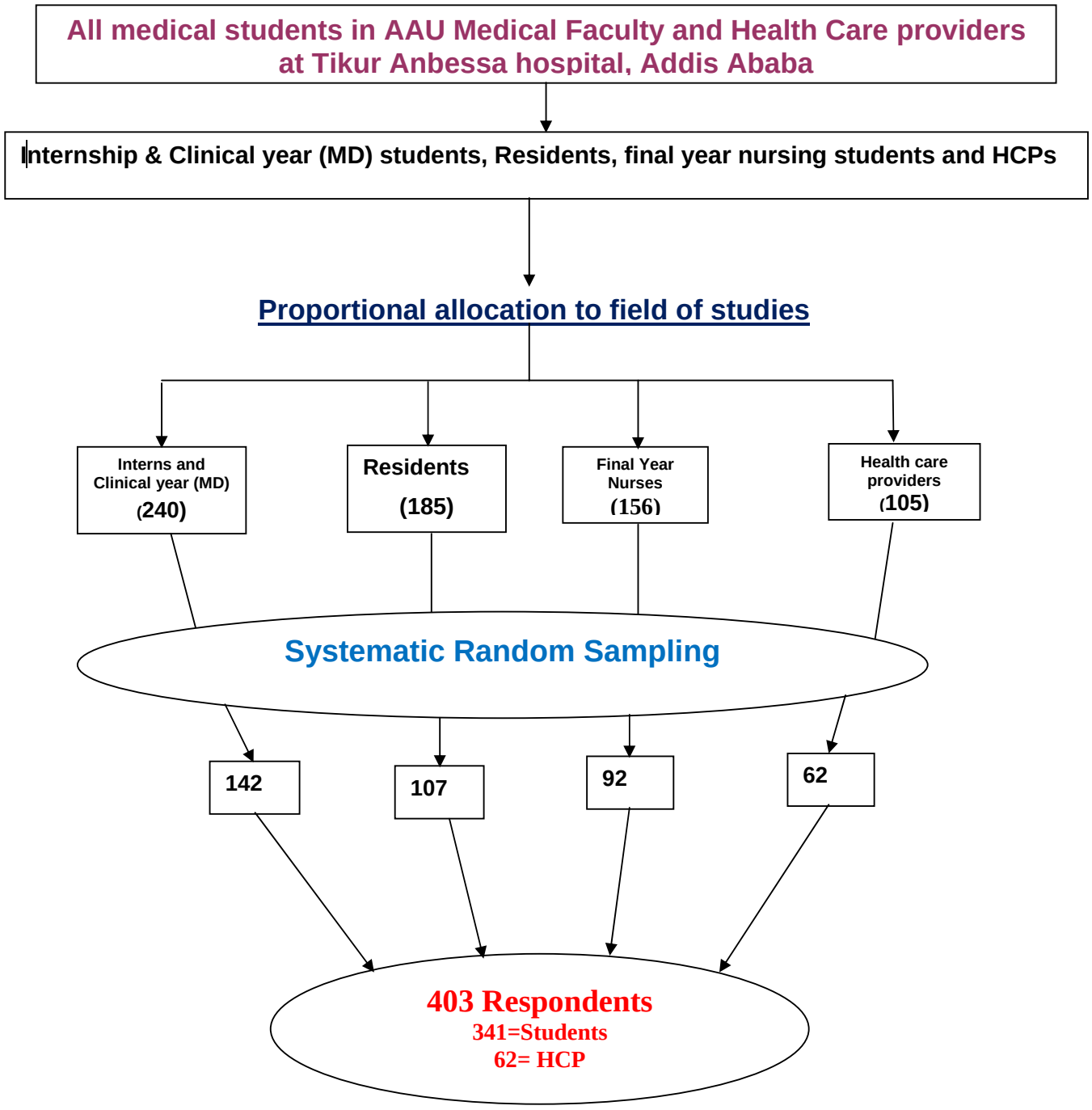
Among all the students in the Medical Faculty, Intern and clinical year-1 medical doctors, final year nursing students (Both clinical and midwives) and residents attending their education and health care providers working in Tikur Anbessa Specialized Hospital during the study period (February to March, 2009) were selected for the study. These groups were selected purposively mainly to increase the likelihood of having more respondents with computer exposure. Then the total sample size was proportionally allocated based on the number of students and health care providers in each category. Finally the respondents were selected randomly from each category. (See figure-1)

Qualitative Study

For the qualitative data in depth interview was conducted with 10 key informants two from each category (Department heads, instructors, physicians working in the hospital, residents and undergraduate medical students) to compliment the quantitative data and also to see the issue from the instructors, department heads and physicians perspective.

Some of the issues addressed during the interview were perception of the current computer skill, access level, gaps to use the available computer and their priority need of computer skill for their academic carrier and/or service delivery needs. Key informants were also asked how to incorporate IT courses in the existing curriculum.

Figure-1: Schematic presentation of the sampling procedure



4.4. Data Collection

4.4.1. Data Collection Tools

Both quantitative and qualitative techniques of data collection were employed in the study.

Quantitative component

Structured questionnaire encompassing all the variables of interest were adapted from other related articles for its consistency reliability next to standard questionnaire and it's modified to the context to fit the current study population. The questionnaires were further developed and enriched by reviewing additional literature. The questionnaires were pre-tested at Hayat Medical College and Zewditu Memorial hospital and modified before actual data collection is commenced. Interns and clinical year medical students, residents and final year nursing students in the medical faculty and health care providers in Tikur Anbessa specialized hospital were interviewed using the structured questionnaire which has items related to knowledge, attitude, access and utilization of ICT. For the quantitative study the structured questionnaire was administered by 5 data collectors and two supervisors. The data collectors were college students of IT background.

Qualitative Component

Semi-structured interview guide was developed to guide the qualitative data collection. In-depth interview was carried out with department heads, Instructors and students of the Medical Faculty and physicians working in Tikur Anbessa Specialized Hospital to gather qualitative information. The in-depth interview was conducted using separate interview guide for each participant from each category of respondents by the principal investigator with the assistance of supervisors. Tape recorder was not used because of the refusal of the key informants to be recorded

4.4.2. Data quality Assurance

The questionnaire was pre tested among medical students in Hyat medical college and health care providers at Zewditu memorial hospital to ensure clarity and uniformity of understanding of questionnaire among data collectors before the actual data collection. The process helped to avoid any inconsistencies and vague questions. Data collectors and supervisors were also oriented on data collection techniques and tools.

The principal investigator was guided the data collectors and supervisor throughout the process, ongoing supervision of the data collection process was undertaken and at the end of each data collection day holds discussion while taking over and checking filled questionnaires for errors.

4.4.3. Data Processing and Analysis

Quantitative data were initially entered and cleaned using EPI-6 dos version and exported to SPSS 15.0 for analysis. Frequency tables, proportions and crosstabs were used for the descriptive analysis. And for presentation tables and different type of graphs were employed. Association between independent variables such as, computer training, computer possession, having computer course, place of high school completed, category of study and socio-demographic characteristics of students and outcome variables of Knowledge, Attitude and Utilization, was examined using odds ratio, X^2 test and logistic regression when it is appropriate. For multivariate analysis the necessary adjustment was done for the possible confounding factors to identify the predicting factor for knowledge, Attitude and utilization of ICT among students category. Hence, internal comparison was done based on the adjusted odds ratio. In line with this the significance level was set at p-value = 0.05.

Qualitative data were analyzed manually. Responses of each key informant were initially categorized based on thematic issues addressed; then similar issues were merged to the selected thematic area. Finally the responses of the in-depth interview were summarized into eight thematic issues. In addition to this, some of the ideas of key informants were quoted as it is for witness.

The regression analysis is restricted to students only due to small number of health care providers in the hospital. Hence, the findings of health care providers were presented only in the descriptive part of the study.

Basic ICT Knowledge status of respondents was assessed by analyzing response to a set of 20 questions. Continuous scores from these categories were dichotomized into "Satisfactory/Good knowledge" and "Unsatisfactory/Poor knowledge". Respondents who score 3rd quartile and above (≥75%) were categorized as having satisfactory knowledge while scores less than 3rd quartile (< 75%) were considered to have unsatisfactory knowledge.

The attitudes of respondents towards ICT were assessed by analyzing response to a set of five questions. Continuous scores from these categories were dichotomized into "Favorable Attitude" & "Unfavorable Attitude". Respondents who score 2nd quartile and above (≥50%) were categorized as having favorable attitude while scores less than 2nd quartile (< 50%) were considered to have unfavorable attitude.

Utilization rate of ICT among the study subjects were assessed by analyzing responses to a set of seven questions. Continuous scores from these category were dichotomized into ''Good'' and ''Poor'' utilization rate. Respondents who score 3rd quantities and above (≥75%) were

categorized as having good utilization rate while scores less than 3rd quartile (<75%) were considered to have poor utilization rate.

4.5. Study Variables

4.5.1. Dependent variables

- Knowledge of respondents on basic ICT
- Attitude of respondents towards ICT
- Utilization of ICT among respondents

4.5.2. Independent Variable

- Socio-demographic characteristics (age, sex, field of study)
- Computer training status (formal or informal)
- Personal computer possession
- Duty in Tikur Anbessa specialized hospital (Student or Health care Provider)
- Year of study for medical students
- Field of study for undergraduate students
- Place where undergraduate students completed their high school study
- Having computer course in current study

4.6. Ethical Considerations

Ethical clearance was obtained from the Research Ethics Committee at the faculty of Informatics and got approval from the joint academic commission of Faculty of informatics and school of public health in Addis Ababa University. Oral consent was sought before administering questionnaire and conducting interview from each selected participant of both

quantitative and qualitative data collection to confirm willingness and those not willing were given the rights to do so. To ensure confidentiality filling of self administered questionnaire was done separately. Confidentiality was ensured throughout the process. Before administering and starting the interview data collectors had informed the study subjects about the purpose and significances of the survey to get the consent of the respondents.

The information that respondents provided were completely confidential and used only for the research purpose. Each respondent had full right to refuse to take part or to stop filling the questioner at any time during the survey.

4.7. Dissemination Plan

The thesis report will first be submitted and presented to School of Public Health and Department of Information Science of Addis Ababa University. The findings of the research will be shared with Tikur Anbessa Specialized hospital, Federal Ministry of Education and Federal Ministry of Health of Ethiopia. Effort will also be made to publish the major findings of the study in one of the peer reviewed journals.

5. Operational definitions

ICT: Mainly focuses respondents knowledge, attitude, access and utilization of computer, Internet and electronic documents

Computer literacy: The level of familiarity of respondents with computers. It generally refers to the ability to use applications rather than to program.

Knowledge on ICT: Refers to the respondents' level of awareness on computer and its application. The minimum level for having knowledge on ICT refers to knowing basic terminologies related to computer hardware and software, communication tools, and Internet services.

Satisfactory knowledge on ICT: Respondents who scored 75% (3rd quartile) and above for a set of 20 basic ICT knowledge questions

Unsatisfactory knowledge on ICT: Respondents who scored less than 75% (3rd quartile) for a set of 20 basic ICT knowledge questions

Access to ICT: The level of availability of computer, Internet, electronic documents for academic or health service needs of respondents in the Medical Faculty and/or Tikur Anbessa Specialized Hospital

Attitude towards ICT: Respondents feeling or perception towards accessing and using of computer, Internet and electronic documents.

Favourable attitude: Respondents who scored median (2nd quartile) and above for a set of five questions of attitude towards ICT

Unfavourable attitude: Respondents who scored below the median (2nd quartile) for a set of five questions of attitude towards ICT

Basic skill: If respondents are able to open the program and able to do some of the MS office program of the specified computer applications

Average skill: Respondents having the basic skill and developed additional skills including the use of different software programs and able to operate the specified computer application regularly for office or academic purpose.

Advanced skill: Respondents knowledgeable of hardware and software and able to operate the specified computer application beyond the routine office application like troubleshoot, advise and teach others.

ICT Utilization: Refers to the routine as well as occasional use of computers and its applications including Internet browsing for the purpose of satisfying academic and/or office requirements.

Good utilization rate: Respondents who scored 75% (3^{rd} quartile) and above for a set of seven utilization related questions

Poor utilization rate: Respondents who scored less than 75% (3^{rd} quartile) for a set of seven utilization related questions

6. Results

6.1. Quantitative study

6.1.1. Demographic characteristics of Respondents

A total of 393 respondents were included for the final analysis of the study making the overall response rate at 97.5%. During the data collection, it was difficult to get completed questionnaires on time especially among health care providers and residents mainly due to workload and fatigue with frequent interview. As a result, the principal investigator was forced to distribute more than 500 questionnaires to attain the minimum required sample size.

As shown in table-1, 238 (60.6%) of respondents were males, 334(85%) were students of different categories in AAU, Medical Faculty, while 59 (15%) were health care providers working at Tikur Anbessa specialized hospital. The age of respondents ranged from 20 to 68 years with median age of 26 and mean (± SD) of 26.85 (± 5.8). Of the total students who participated in this study 228(68.3%) and 106 (31.7%) were undergraduate and postgraduate students respectively. Among the total undergraduate students, 140 (61.4%) were internship and clinical year medical doctor students, while the remaining 88(38.6%) were final year clinical nurses and midwives. Majority of the undergraduate students 128 (61.5%) completed their high school study in Addis Ababa.

Among the total respondents of health care providers only 18 (30.5%) were married and 41(69.5%) were single and widowed. Concerning their profession and current position in the hospital 24 (40.7%) were General practitioner and specialists, 22 (37.3%) were nurses and the remaining 13 (22.1%) were medical laboratory technologist and pharmacists. Only 7 (11.9%) of the respondents of HCPs were department heads and metron during the study period, 52 (88.1%) were physicians, staff nurses, lab technicians and pharmacists in the hospital. The median service year of health care providers was 6 years with mean (±SD) of 8.10 (± 6.5).

Table-1: Socio-demographic characteristics of respondents in AAU, Medical Faculty and Tikur Anbessa Specialized Hospital Addis Ababa March, 2009

Characteristics	N= 393 Frequency	%
Sex		
Male	238	60.6
Female	155	39.4
Age groups		
20-24	179	45.5
25-29	98	24.9
30-34	80	20.4
35-39	24	6.1
40-44	8	2.1
45+	4	1.0
Type of Respondents		
Medical students	334	85.0
Health Care providers	59	15.0
Marital Status	**N= 59**	
Single	40	67.8
Married	18	30.5
Divorced	1	1.7
Category of study	**N= 334**	
Undergraduate	228	68.3
Postgraduate	106	31.7
Under graduate year of study	**N=228**	
Internship	80	35.1
Clinical year	60	26.3
Final year Clinical Nurses	47	20.6
Final year Midwives	41	18.0
Place of High school completed for UG	**N=208**	
Addis Ababa	128	61.5
Regions	80	38.5

Socio-demography Continued

Postgraduate Field of study	**N=106**	
Internal medicine	30	28.3
Surgery	21	19.8
Pediatrics	16	15.1
Obstetrics & Gynecology	15	14.2
Radiology	12	11.3
Ophthalmology	12	11.3
Service year for HCPs	**N=59**	
≤ 5 years	25	42.4
6 to 10 years	20	33.9
>10 years	14	23.7
Professional category (HCP)	**N=59**	
Specialist Physician	6	10.2
General Practitioner	18	30.5
Clinical Nurse (B.Sc)	22	37.3
Pharmacist (B.Sc)	5	8.5
Medical Laboratory (B.Sc)	8	13.5
Position in the hospital (HCP)	**N=59**	
Physician	23	39.0
Department Head	5	8.5
Metron	2	3.4
Staff nurse	11	18.6
lab technician	7	11.9
Physiotherapist	7	11.9
Others	4	6.7

NB: Percentages are calculated using denominator for each group.

6.1.2. Knowledge on Basic Information communication Technology

In general the knowledge status of respondents was assessed by analyzing response to a set of 20 questions. Continuous scores from these categories were dichotomized into "Satisfactory/Good knowledge" and "Unsatisfactory/Poor knowledge". Respondents who scored 3rd quartile and above (≥75%) were categorized as having satisfactory knowledge while scores less than 3rd quartile (< 75%) were considered to have unsatisfactory knowledge. Accordingly, a total of 98(24.9%) respondents found to be categorized as having satisfactory knowledge. Out of which 41(41.8%) were interns and clinical year medical doctor students, 29 (29.6%) were residents, 15 (15.3%) were health care providers and 13(13.3%) were final year nursing students. When the proportion of knowledge level was assessed within the respondents category, the study indicated that 29.3% of interns and clinical year medical doctors, 27.4% of residents, 25.4% of HCPs and 14.8% of final year nurses had satisfactory knowledge on ICT.

All study subjects responded to basic ICT knowledge questions mainly about computer hardware, software, devices and communication tools. As indicated in table-2 out of those who responded, 312(79.4%) knew digital computer does its computation using binary systems, 238 (60.6%) knew CPU as a hardware, 203 (51.7%) knew data in the form other than database can be accessed through a network, 342(87.%) knew networks allow different PCs to access the same file, 177(45%) knew RAM as temporary memory in the computer, 326 (83%) knew modem as a device to allow computer to communicate using a telephone line, 304(77.4%) knew CD has a larger data storage capacity than flopy-disc, 282(71.8%) understood that people who work at home often communicate with their office using the modem and 300(76.3%) were aware of the existence of telemedicine service at Tikur Anbessa Specialized Hospital.

Table-2: Knowledge of respondents on the basics of ICT AAU, Medical Faculty and Tikur Anbessa Specialized Hospital Addis Ababa March, 2009

Characteristics	N=393 Frequency	%
Digital computer does its computation using binary system		
Yes	312	79.4
No	81	20.6
Digital sound and video can be communicated over a network		
Yes	336	85.5
No	57	14.5
CPU is hardware		
Yes	238	60.6
No	155	39.4
Communication b/n PCs made by different vendor is impossible		
Yes	71	18.1
No	322	81.9
Only data in the form of database can be accessed using a network		
Yes	190	48.3
No	203	51.7
Email is the fastest and secured mode of mail system		
Yes	325	82.7
No	68	17.3
The flopy disc has a larger capacity than the compact disk		
Yes	89	22.6
No	304	77.4
RAM is a permanent memory in the computer		
Yes	216	55.0
No	177	45.0
A modem allows computers to communicate using telephone line		
Yes	326	83.0
No	67	17.0
People who work at home often communicate with their office using the modem		
Yes	282	71.8
No	111	28.2
Aware of telemedicine service to be provided at Tikur Anbessa Hospital		
Yes	300	76.3
No	93	13.7

From the total respondents 260 (66.2%) of them knew at least one kind of secondary computer data storage devices. All study subjects were asked four multiple response questions to assess their knowledge on secondary computer data storage devices. Accordingly, 293 (74.6%) knew about compact disk, 350 (89.1%) knew floppy disk, 296 (75.4%) knew flash disk (USB) and 260 (66.2%) knew DVD as secondary computer data storage devices. The details of secondary data storage device responses were described under table-3. Respondents were asked basic ICT terminology questions. Out of 20 basic ICT terminologies the respondents mean (±SD) score were 12.95 (± 4.12). Accordingly, the proportion of respondents who scored above the mean score was 223(56.7%).

Table-3: Knowledge of respondents on secondary computer data storage devices AAU, Medical faculty and Tikur Anbessa Specialized Hospital Addis Ababa March, 2009

Variables	N=393	
	Frequency	%
Which of the following is secondary data storage of computer?		
Compact Disk		
Yes	293	74.6
No	100	25.4
Flopy Disk		
Yes	350	89.1
No	43	10.9
Flash disk (USB)		
Yes	296	75.3
No	97	24.7
DVD		
Yes	260	66.2
No	133	33.8

Predictors of Knowledge on ICT

After adjustment was done for the possible confounding factors, computer possession had significant difference in knowledge status of students; those who have personal computer in their home 57(68.7%) were more likely to have satisfactory knowledge compared with those who didn't have [OR (95% CI) = 3.17(1.65, 6.11)]. In relation to socio-demographic characteristics, males were more likely to be knowledgeable compared with females [OR (95%CI) = 2.29 (1.22, 4.29)]. It was also the age group 20 to 24 years 46 (55.4%) and 25 to 29 years (25.3%) had a likelihood of better knowledge of computer among the other age groups [OR (95%CI) = 3.2(1.1, 9.27) and 2.25(1.01, 5.01)].

Concerning course given in the medical faculty, from the total students 201(60.2%) reported that they attended computer course (Introduction to computer) as part of undergraduate training. The course was delivered in the 1st, 2nd and 3rd year of study for 121 (60.2%), 75(37.3%) and 5(2.5%) respondents of students respectively. All residents had no computer course in their current study as well as during their undergraduate training. However, having computer course in the undergraduate training had no significance difference in the knowledge level among the students.

Figure-2: Respondents' awareness of the existence of telemedicine service in Tikur Anbessa Specialized Hospital compared with formally visiting the center Addis Ababa March, 2009

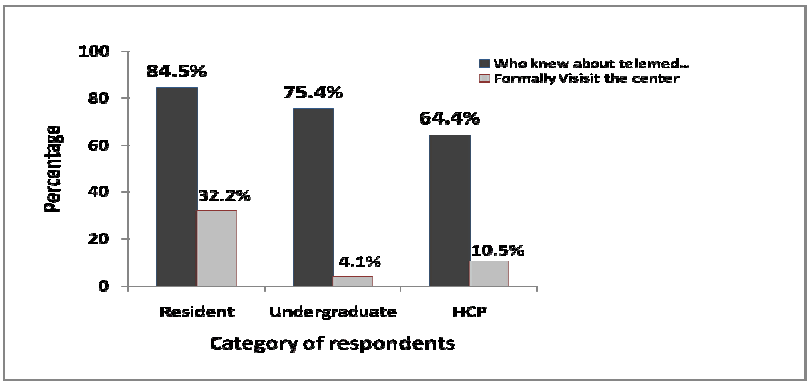


Table-4: Multivariate logistic regression of selected variables in relation to knowledge status of students in AAU, Medical Faculty Addis Ababa March, 2009

	Knowledge			
Variables	**Yes (%)**	**No (%)**	**COR(95%CI)**	**AOR(95%CI)**
Sex				
Male	59(29.2%)	143(70.8%)	**1.86(1.09, 3.17)***	**2.29(1.22, 4.29)***
Female†	24(18.2%)	108(81.8%)	1.00	1.00
Age groups				
20-24	46(27.2%)	123(72.8%)	1.61(0.85, 3.06)	**3.20(1.10, 9.27)***
25-29	21(26.3%)	59(73.7%)	1.54(0.73, 3.21)	**2.25(1.01, 5.01)***
30 and above†	16(18.8%)	69(81.2%)	1.00	1.00
Category of respondents status				
Internship & Clinical year	41(29.3%)	99(70.7%)	**2.39(1.2, 4.77)***	1.22(0.55, 2.74)
Resident	29(27.4%)	77(72.6%)	**2.17(1.05, 4.50)***	1.43(0.37, 5.57)
Final year Nurses†	13(14.8%)	75(85.2%)	1.00	1.00
Place High school completed for UG				
Addis Ababa	37(28.9%)	91(71.1%)	1.76(0.89, 3.48)	1.34(0.60, 3.01)
Regions†	15(18.8%)	65(81.2%)	1.00	1.00
Computer training status				
Yes	52(25.2%)	154(74.8%)	1.06(0.63, 1.76)	1.17(0.66, 2.09)
No†	31(24.2%)	97(75.8%)	1.00	1.00
Computer Possession				
Yes	57(31.8%)	122(68.2%)	**2.32(1.37, 3.92)***	**3.17(1.65, 6.11)***
No†	26(16.8%)	129(83.2%)	1.00	1.00
Having computer course				
Yes	49(24.4%)	152(75.6%)	0.95(0.57,1.56)	1.17(0.46, 3.01)
No†	33(25.4%)	97(74.6%)	1.00	1.00

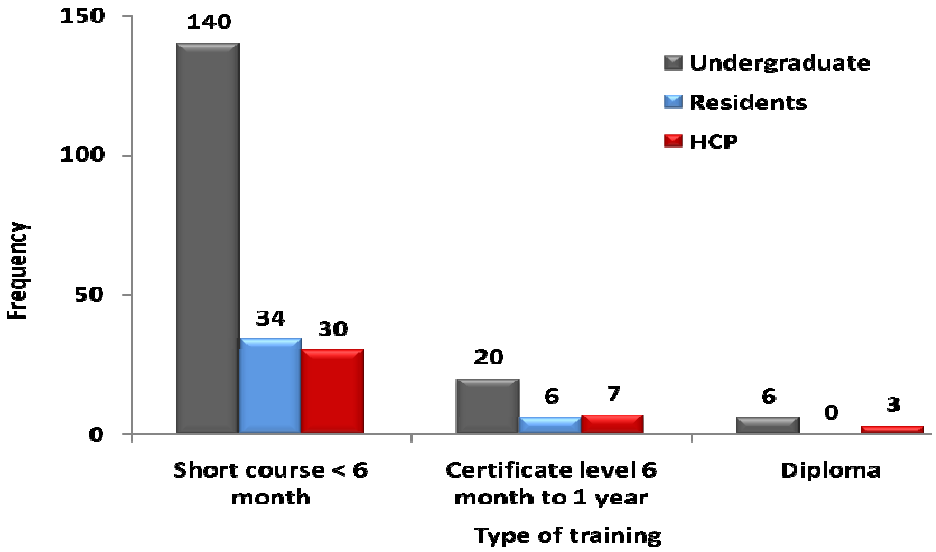
*Significant at P-value <0.05

†Reference Group

6.1.3. Access and attitude of respondents towards ICT

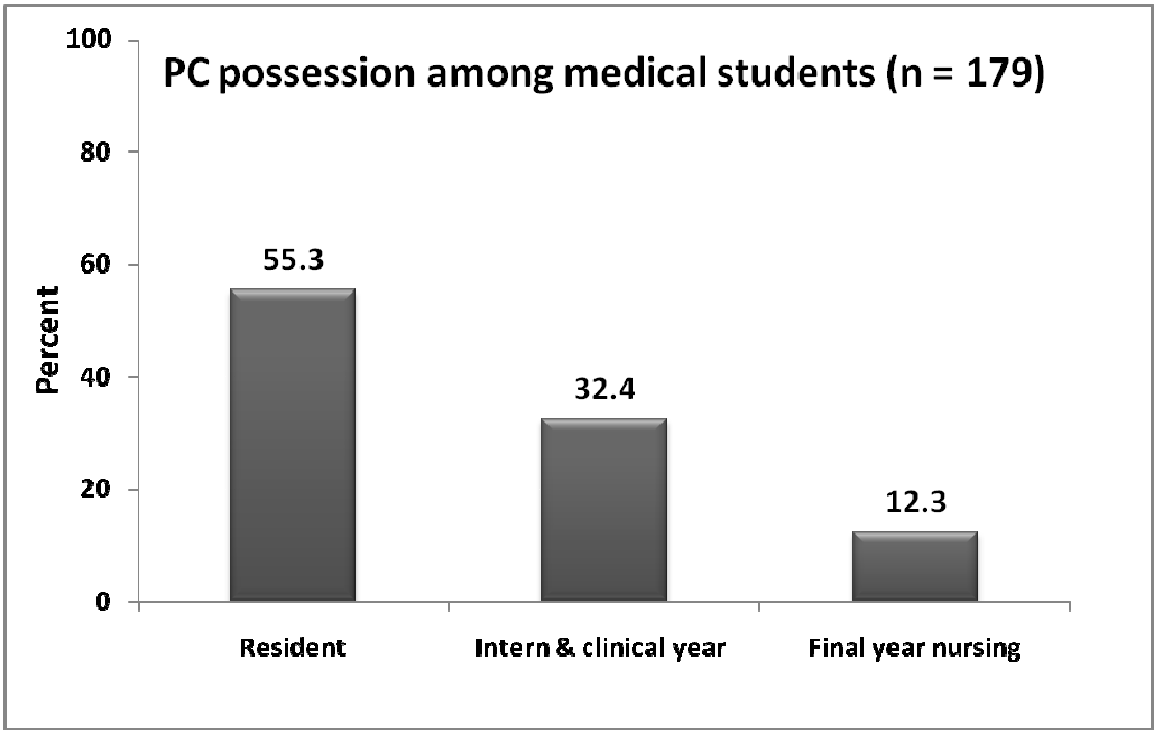
As displayed in figure-3 below, from the total respondents 246 (62.6%) had taken different level of computer training. Among those who received training majority of them 204 (82.9%) received short term course (< 6 month) training, 33(13.4%) were received certificate level (6 month to 1 year) training and only 9 (3.7%) who had taken diploma level computer training (education). Out of the total computer trained respondents 101 (41%) were interns and clinical year medical doctor students, 65 (26.4%) were final year nursing students, 40(16.3%) were residents and 40 (16.3%) were also health care providers. When the proportion of computer training status of respondents were assessed within the category of respondents, 73.9% of final year nurses, 72% of interns and clinical year medical doctors, 67.8% of HCPs and 37.7% of residents were received the training.

Figure-3: Distribution and type of Computer training among respondents of the study in AAU, Medical Faculty and Tikur Anbessa Specialized Hospital Addis Ababa March, 2009



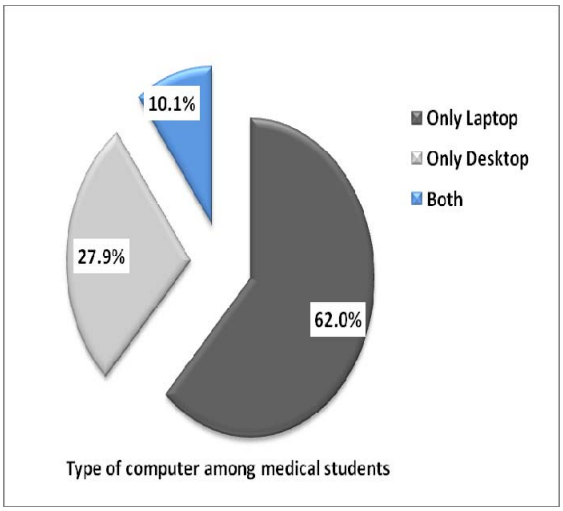
Two hundred three (51.7%) of the total study subjects had at least one personal computer in their home among them 119 (58.6%) had Laptop, 63 (31.0%) had desktop and 21 (10.4%) had both laptop and desktop. Among the health care providers 24 (40.7%) of them had at least one type of computer in their home. Possession of personal computer among students and health care providers are described under Figure-4 and 5. Regarding access towards e-document in the form of CD-ROM/e-text books in the library or at home, 226(57.5%) of respondents had access to e-documents. Among those who had access to e-document, 91(40.3%) were Intern and clinical year medical doctors, 81 (35.8%) were residents, 34(15.0%) final year nursing students & 20(8.9%) were health care providers. Only 117 (29.8%) had access to online medical journal of which 60(51.3%), 40 (34.2%) & 17(14.5%) were residents, undergraduates and health care provides respectively.

Figure-4: Computer possession of students in relation to their field of study in AAU, Medical Faculty Addis Ababa March, 2009



As described under table-5 from the total study subjects 294(74.8%) had access to Internet for different purposes. Of which 113(38.4%) were Interns and clinical year medical doctors, 95(32.3%) residents, 50(17%) were health care providers. The most frequently mentioned places for Internet access were Internet café which contains 137 (46.6%) followed by school/office 98(33.3%) and only 59 (20.1%) had Internet access in their home. Among the medical students 201(60.2%) had computer course in their current study. All of them were undergraduate students and 195(97%) had computer lab session during their course. With regard to adequacy of the lab session 174(89.2%) medical students were unsatisfied in their computer lab session.

Figure-5: Pi-chart showing type of personal computer among respondents in AAU, Medical Faculty and Tikur Anbessa Specialized Hospital Addis Ababa March, 2009



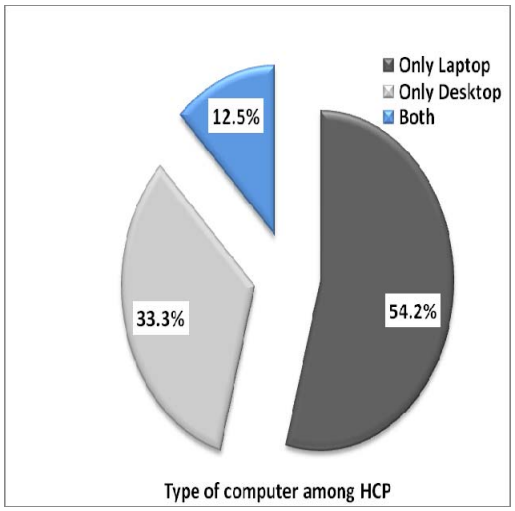


Table-5: Respondents' access and attitude towards ICT in AAU, Medical Faculty and Tikur Anbessa Specialized Hospital Addis Ababa March, 2009

Variables	N=393 Frequency	%
Computer training status		
Yes	246	62.6
No	147	37.4
Type of training received	**N= 246**	
Short course (<6 month)	204	82.9
Certificate (6 month- 1 year)	33	13.4
Diploma	9	3.7
Computer Possession		
Yes	203	51.7
No	190	48.3
Access to e-documents in your field of study like (CD-ROM, Magnetic tape)		
Yes	226	57.5
No	167	42.5
Internet Access		
Yes	294	74.8
No	99	25.2
Common place for Internet access	**N=294**	
Internet café	137	46.6
Campus/Office	98	33.3
Home	59	20.1
Access to online medical journal/Organizational subscription	**N=294**	
Yes	117	39.8
No	177	60.2

Access and Attitude Continued

Computer is used as a course in your study	**N=382**	
Yes	237	62.0
No	145	38.0
Working on computer is enjoyable		
Agree	307	78.1
Don't Agree	86	21.9
ICT has a role in medical profession		
Agree	382	97.2
Don't Agree	11	2.8
Which statement describes best the way you feel about using computer		
Feel very confident	110	28.0
I feel I can cope	239	60.8
I lack in confidence	44	11.2

NB: Percentages are calculated using denominator for each group.

The attitude of respondents was assessed by analyzing response to a set of 5 questions. Continuous scores from these categories were dichotomized into "Favorable Attitude" and "Unfavorable Attitude". Respondents who score 2nd quartile and above (≥50%) were categorized as having favorable attitude while scores less than 2nd quartile (< 50%) were considered to have unfavorable attitude. As a result, 329 (83.7%) of all respondents had favorable attitude towards ICT. Among respondents who had favorable attitude towards ICT, 124 (37.7%) were interns and clinical year medical doctor students, 68 (20.7%) were final year nurse students, 92(28%) were residents and 45 (13.7%) were health care providers. The proportion of attitude level within respondents category were found to be 88.6% of interns and clinical year medical doctors, 86.8% of residents, 77.3% of final year nurses and 76.3% of health care providers.

As indicated on table – 5 above, about 382 (97.2%) of the total study subjects thought that information communication technology has a role to play in the medical profession. Among the total respondents 110 (28%) feel very confident when using computer 239(60.8%) feel that they can cope using computer easily & only 44(11.2%) completely lack confidence in using computer.

Predictors of Attitude towards ICT

As it is shown in table- 6 below, after adjusting the necessary variables influencing attitude of ICT among students, residents were more likely to have better attitude level among respondents category [OR (95%CI) = 29.34(4.83, 178.4)]. The wide confidence interval was due to the limited sample size among groups. It was also true that respondents who had different type of computer training were more likely favorable attitude compared with those who did not [OR (95%CI) =19.76(7.56, 51.63)]. Regarding computer possession of study subjects in relation with their attitude level, out of all students who possessed personal computer 161(89.9%) had positive attitude. However, personal computer possessions had not significant difference in attitude level among students category. Having computer course in their stay in high school/college/university previously or currently had no significance difference in the attitude level of students for the crude odds ratio but when it is adjusted for other variables students having computer course during their current study have favorable attitude towards ICT compared with those who have no computer course in their current study [OR (95%CI) = 4.28(1.42, 12.94)].

The study indicated that younger age groups of 25-29 more likely to have favorable attitude compared with the older age counterparts [OR (95%CI) = 3.54 (1.18, 10.64)]. Respondents' category like year and field of study among undergraduate, sex and place where high school completed did not have significant difference in attitude level of respondents.

Table-6: Multivariate logistic regression of selected variables in relation to attitude of students in AAU, Medical Faculty Addis Ababa March, 2009

	Attitude			
Variables	**Favorable (%)**	**Unfavorable(%)**	**COR(95%CI)**	**AOR(95%CI)**
Sex				
Male	169(83.7%)	33(16.3%)	0.76(0.4, 1.42)	0.66(0.28, 1.57)
Female †	115(87.1%)	17(12.9%)	1.00	1.00
Age group				
20-24	145(85.8%)	24(14.2%)	1.62(0.83, 3.19)	3.02(0.80, 11.38)
25-29	72(90%)	8(10%)	2.42(0.99, 5.93)	**3.54(1.18,10.64)***
30 and above †	67(78.8%)	18(21.2%)	1.00	1.00
Respondents status				
Internship and Clinical year	124(88.6%)	16(11.4%)	**2.28(1.11, 4.69)***	3.14(1.0, 9.91)
Residents	92(86.8%)	14(13.2%)	1.93(0.91, 4.10)	**29.34(4.83,178.4)***
Final year Nurses†	68(77.3%)	20(22.7%)	1.00	1.00
Place High school finished for UG				
Addis Ababa	105(82%)	23(18%)	0.65(0.29, 1.45)	0.46(0.13, 1.63)
Regions†	70(87.5%)	10(12.5%)	1.00	1.00
Computer training status				
Yes	198(96.1%)	8(3.9%)	**12.1(5.45,26.83)***	**19.76(7.56, 51.63)***
No†	86(67.2%)	42(32.8%)	1.00	1.00
Computer Possession				
Yes	161(89.9%)	18(10.1%)	**2.33(1.25, 4.34)***	1.66(0.62, 4.45)
No†	123(79.4%)	32(20.6%)	1.00	1.00
Having computer course				
Yes	178(88.6%)	23(11.4%)	1.84(0.99,3.41)	**4.28(1.42, 12.94)***
No†	105(80.8%)	25(19.2%)	1.00	1.00

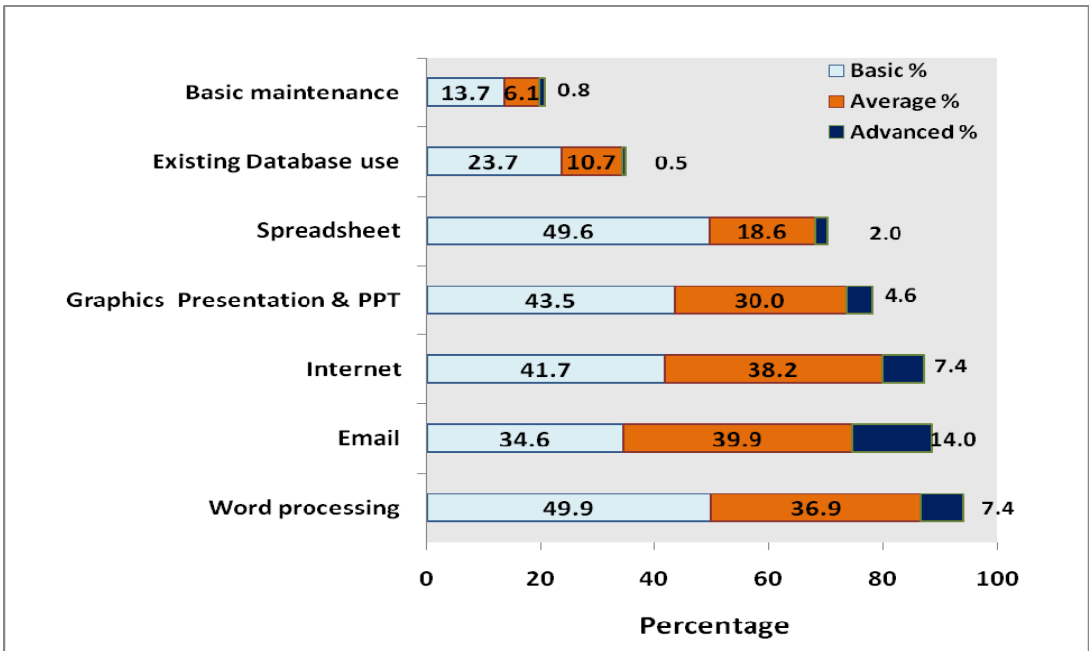
*Significant at P-value <0.05
†Reference Group

6.1.4. Computer application Skill

6.1.4.1. Competence in basic application skills

The highest level of competence, reported by the study subjects were word processing 370(94.1%), email use 348(88.5%), Internet browsing 343(87.3%) and powerpoint presentation 307(78.1%) (See figure-6). For the remaining items most of them reported low levels of competence. Out of the total respondents 174 (44.3%) reported that they had average and above competence of word processing skill and only 81(20.6%) had average and more competence of spreadsheet skills like excel. Around 136(34.6%) of respondents had more than basic competence of graphics and powerpoint presentation skills. 179(45.6%) of the study subjects had average and above skill of Internet browsing technique. Unlike office application, use of existing database and basic maintenance skill were very minimal. Among the total participants of the study only 44(11.2%) and 27(6.9%) of them had average competence of using existing database and basic maintenance respectively. From the total respondents of the study none of them had a competence of database design or programming skill.

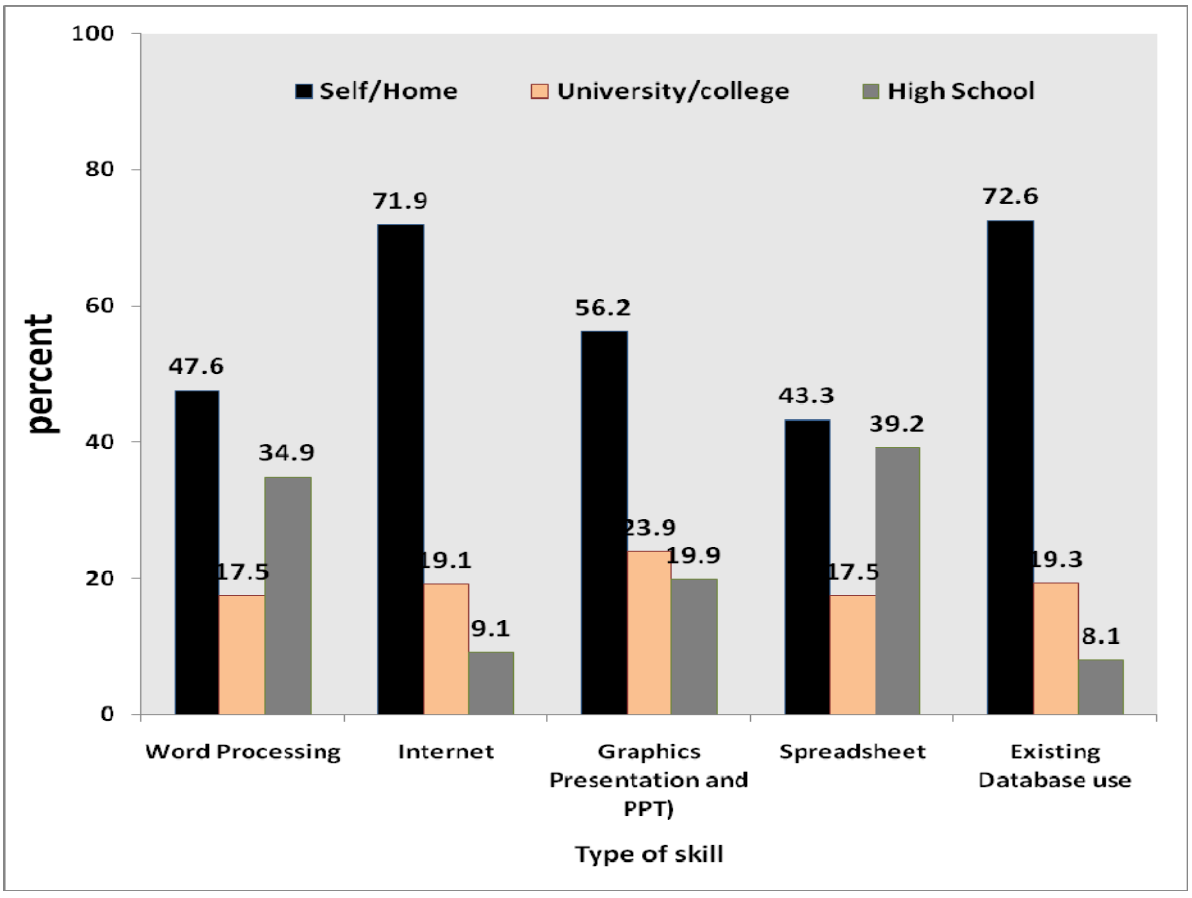
Figure-6: Respondents' Competence of different computer application skills in AAU, Medical Faculty and Tikur Anbessa Specialized Hospital Addis Ababa March, 2009



6.1.4.2. Common place for acquiring skill

As displayed in figure 7 and 8 below, majority of the respondents reported that their competences of application skills were acquired from self effort and at home. Skills acquired from university/college and work place were at very low level. From those who had word processing skill, 169(47.6%) of them acquired it at home by personal effort, 124(34.9%) were acquired it in high school. Similarly, from those who had competence of Internet browsing skill, 230 (71.9%) were acquire their skill by self effort and 61(19.1%) were from university. Concerning graphics and PPT skill, 167 (56.2%) were acquired the skill through self effort and only 71(23.2%) were from university. Among the HCPs skill acquired from work place is mentioned 87 times which implies 38% of the skills were acquired from work place.

Figure-7: Common places and ways of acquiring different computer application skills among students in AAU, Medical Faculty Addis Ababa March, 2009.



6.1.5. Utilization of ICT

Out of the total study subjects almost all of them 383 (97.5%) had ever used computer for at least one application. Among these 164 (42.8%) used it every day, 93(24.3%) were once in a week time, 31(8.1%) were once in two weeks time and 95(24.8%) once in a month or more. When respondents asked the last time they used computer, 172(44.9%) used it a day before data collection, 51 (13.3%) were used three days before, 71(18.5%) used a week before and 93(24.3%) used months before.

The general utilization status was assessed by analyzing responses to a set of seven questions. Continuous scores from these category were converted to ordinal ''Good'' and ''Poor'' utilization scale. Respondents who scored the 3rd quartile and above (≥75%) were categorized as having good utilization status while scores less than the 3rd quartile (<75%) were considered to have poor utilization status. Accordingly, 128 (32.6%) were scored good utilization status. Among those who scored good utilization status, 67(52.3%) were residents, 39(30.5%) were interns & clinical year medical doctor students, 16 (12.5%) were health care providers and 6(4.7%) were final year nurses. To this end, the proportion of ICT utilization within the category of respondents showed that 63.2% of residents, 27.8% of interns and clinical year medical doctors, 27.1% of HCPs and 6.8% of final year nurses had good utilization rate.

As described under table-7, out of the total respondents only 130 (33.1%) had ever used computer assisted learning package in high school or at home. i.e. learning package through CD-ROM, online education, video conferencing, etc. The remaining 185 (47.1%) never used and 78(19.8%) never heard the term before. Among the total respondents who had ever used computer, only 186 (47.3%) use Powerpoint application. Of which 33(17.7%) were used only once, 50 (26.9%) were used 2-3 times only and 103(55.4%) used more than three times. Most

of the residents 87(46.8%) utilize powerpoint application followed by interns and clinical year medical doctors 63(33.9%) the remaining were HCP 24(12.9%) and final year nurses 12(6.5%). Majority of the study subjects 315 (80.2%) had never participated in video conference, 36 (9.7%) participated only once and 42 (10.7%) participated twice or more in their life time. Among the total study subjects 342(87%) of them were Internet users and this figure increases to 89.3% if it is among ever use computer. Similarly, 316 (80.4%) of respondents had email address for their mail communication this proportion increased to 82.5% from those who ever use computer. To identify the main purpose of Internet use among participants, the study subjects responded for 7 multiple response questions. Accordingly, most of them used for email service 308 (90.1%), for research/education 226 (66.1%), for news/film 122 (35.7%), for chatting 76(22.2%) and for game 48(14%).

Figure-8: Respondents' places and ways of acquiring the common computer application skills in AAU, Medical Faculty and Tikur Anbessa Specialized Hospital Addis Ababa March, 2009.

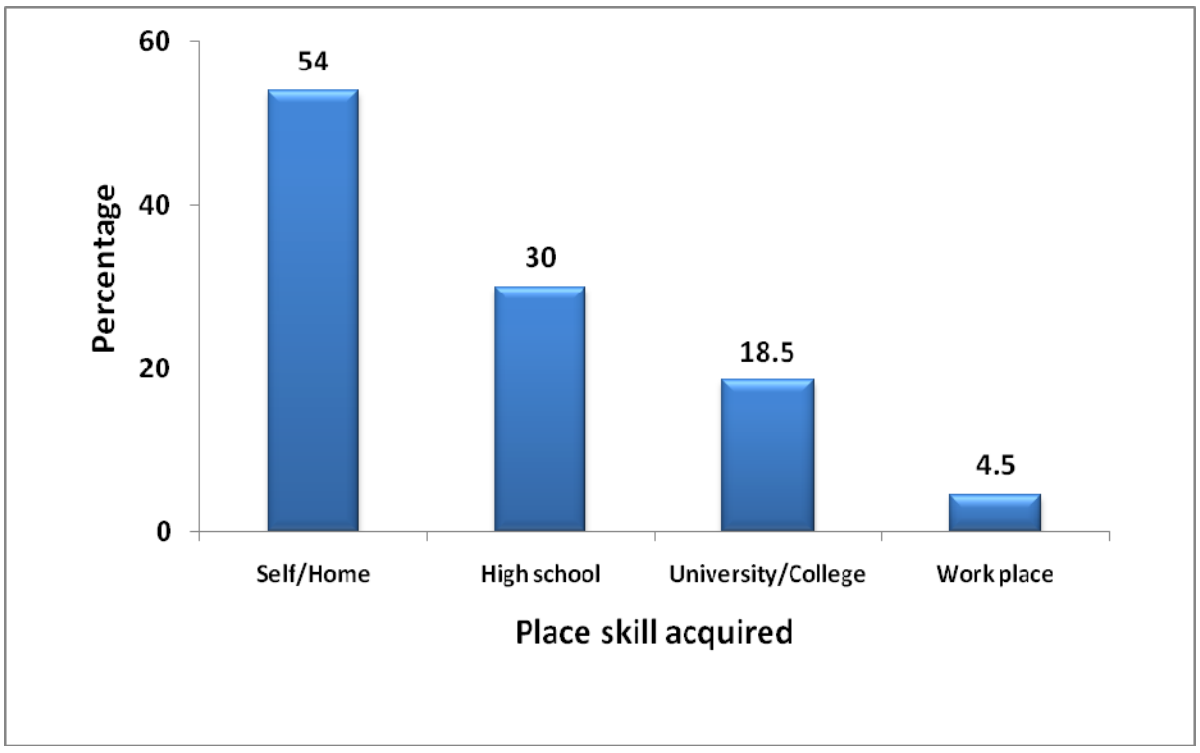


Table-7: **Respondents' utilization of ICT in AAU, Medical Faculty and Tikur Anbessa Specialized Hospital Addis Ababa March, 2009**

Variables	N=393	
	Frequency	%
Ever used computer		
Yes	383	97.5
No	10	2.5
Frequency of computer use	**N=383**	
Almost every day	164	42.8
Once in a week	93	24.3
Once in two weeks	31	8.1
Once in a month or more	95	24.8
Computer used for the last time	**N=377**	
Yesterday	172	45.6
3 days before	51	13.5
Weeks before	71	18.9
Months before	83	22.0
Internet Use	**N=383**	
Yes	342	89.3
No	41	10.7
Have email address	**N=383**	
Yes	316	82.5
No	67	17.5
Frequency of Internet use	**N=342**	
Occasionally	172	50.3
Once per week	77	22.5
2-3 times per week	55	16.1
4 and more times per week	38	11.1
What do you use the Internet for (Multiple response)	**N=342**	
Mail	308	90.0
Research/Education	226	66.1
News/sport/film	105	30.7
Chatting	76	22.2
Game	48	14.0
Using Online medical journal	**N=342**	
Yes	115	33.6
No	227	66.4
Produce Powerpoint presentation		
Yes	186	47.3
No	207	52.7

NB: Percentages are calculated using denominator for each group.

Predictors of ICT utilization among students

After adjustment for the possible confounding factors to utilization status of ICT among students, the utilization status of ICT among gender was statistically significant before adjustment this is may be due to confounding factors. Among the field of study residents 67(63.2%), interns and clinical year medical doctors 39 (27.9%) and final year nurses 6(6.8%). Residents and Intern students were more likely better utilization rate of ICT among students [OR (95% CI) = 6.84(1.46, 31.99)], [OR (95% CI) =5.01(1.71, 14.69)]. Provision of different level of computer training (short term or certificate and above) improved the utilization status of ICT among students [OR (95%CI) = 2.26(1.12, 4.55)]. Moreover, respondents who have personal computer at home were more likely had better utilization status compared with who didn't have [OR (95% CI) = 5.67 (2.68, 11.99)].

Among the total students who had satisfactory knowledge 43(51.8%) of them had good utilization rate. In line with this, students who scored satisfactory knowledge had more likely better utilization rate compared to those who had unsatisfactory knowledge score [OR (95%CI) = 2.52(1.31, 4.84)]. However, attitude towards ICT has no significant difference in respondents' utilization status.

Regarding socio-demographic characteristics and other variables like sex, age group, place where high school completed and having computer course for the current study had no significance difference in utilization status among respondents of medical students.

Table-8: Multivariate logistic regression of selected variables in relation to utilization of ICT among students in AAU, Medical Faculty Addis Ababa March, 2009

Variables	Utilization		COR(95%CI)	AOR(95%CI)
	Yes	No		
Sex				
Male	79(39.1%)	123(51.9%)	**1.93(1.19, 3.13)***	1.25(0.65, 2.40)
Female†	33(25%)	99(75%)	1.00	1.00
Age groups				
20-24	35(20.7)	134(79.3%)	0.34(0.19, 0.60)	0.64(0.20, 2.08)
25-29	40(50%)	40(50%)	1.30(0.70, 2.40)	2.09(0.91, 4.76)
30 and above†	37(43.5%)	48(56.5%)	1.00	1.00
Category of respondents				
Internship & Clinical year	39(27.9%)	101(72.1%)	**5.28(2.13, 13.08)***	**5.01(1.71, 14.69)***
Resident	67(63.2%)	39(36.8%)	**23.48(9.37, 58.8)***	**6.84(1.46, 31.99)***
Final year Nurses†	6(6.8%)	82(93.2%)	1.00	1.00
Place High school completed for UG				
Addis Ababa	31(24.2%)	97(65.8%)	1.65(0.8, 3.38)	1.74(0.63, 4.75)
Regions†	13(16.3%)	67(83.7%)	1.00	1.00
Computer training status				
Yes	67(32.5%)	139(67.5%)	0.89(0.56, 1.42)	**2.26(1.12, 4.55)***
No†	45(35.2%)	83(64.8%)	1.00	1.00
Computer Possession				
Yes	96(53.6%)	83(46.4%)	**10.1(5.54, 18.22)***	**5.67(2.68, 11.99)***
No†	16(10.3%)	139(89.7%)	1.00	1.00
Having computer course				
Yes	41(20.4%)	160(79.6%)	0.22(0.14, 0.36)	0.74(0.26,2.07)
No†	70(53.8%)	60(46.2%)	1.00	1.00
Knowledge Status				
Good	43(51.8%)	40(48.2%)	**2.84(1.70, 4.73)***	**2.52(1.31, 4.84)***
Poor†	69(27.5%)	182(72.5%)	1.00	1.00
Attitude to ICT				
Positive	100(35.2%)	184(64.8%)	1.72(0.86, 3.44)	0.86(0.32, 2.26)
Negative†	12(24%)	38(76%)	1.00	1.00

* Significant at P-value <0.05
RG= Reference Group

6.2. Qualitative study

Descriptions of Health care providers and Department heads

A total of 10 key informants were involved in the in-depth interview drawn from different working environment. Four of them were department heads and instructors, five final year residents and undergraduate students, and the remaining one represented the health care providers. Two of the department heads were working both as an instructor and department head for the last 5- 8 years. Two of the lab instructors from the medical faculty computer lab unit in Tikur Anbessa specialized hospital one was head of the unit and the other was lab assistant. The health care providers have worked as a physician in different departments and hospitals for the last 10 years. All the students involved in this interview were final year in both the undergraduate and post graduate studies. Below are summarized thematic issues of the discussion with the key informants during the in-depth interview:

- The status of medical students, instructors and health care providers in relation to computer application skills for their academic and health care provision purpose
- Access towards ICT in their learning and working environment
- Gaps to use the computer if any and their recommendation to feel this gap
- The status of Internet connection (availability, reliability and speed) of the available computer in each department and its main purpose of use.
- Advantages of ICT in the health system especially in the clinical aspect
- Appropriateness computer course delivered in the medical faculty in terms of delivery period, mode of delivery including its practical session and the possible recommendations as to the way to improve the existing course for the medical students.
- What are the main needs of computer skill in your stay of the medical faculty that helps for current study as well as in your future career?

Computer skill

All of the department heads, instructors and students agreed that currently the status of computer skill among the students and instructors were relatively improved when compared to previous days in terms of using it for the purpose of powerpoint presentation, word processing and literature searching through Internet browsing. One of the residents stated his observation as;

> *"Previously before six years computer skill was almost non existence among residents and health care providers. But currently, it is by far better in terms of basic computer application skills"*

Instructors from ICT unit and undergraduate students reported that computer skill among students was differing according to their age and area of residence. Students of younger age have better skill of using the computer in the computer lab than the older ones. In terms of area of residence, students from Addis Ababa have relatively better skill than those who came from the regions who have only some theoretical knowledge in their high school education. One intern medical doctor student who came from region expressed his experience of computer exposure as;

> *"I myself have only theoretical knowledge on computer during my high school education in the country side. I got the chance to sit down in front of a computer and touch the mouse after I joined AAU Medical faculty"*

Access to computer

Almost all the interview participants have reported that there is very limited access to computer among the health care providers and medical students in the faculty of medicine as well as in the hospital. Majority of the health care providers had no access to computer in their office.

Only department heads and limited number of instructors had access to desktop computer at their office in the medical faculty. In line with this, most of the residents were using their own personal computer for their academic purpose. As a result, they had relatively better access to computer when compared with other categories of students in the faculty. One postgraduate student expressed his view of availability of computer in the department as follows;

> *"In our department there is no computer dedicated only for academic purpose. There are around 3 desktop computers and one laptop for more than 70 students. Two of the desktops are used only for secretary service and the other one is for the head of the department. The laptop is used only for case presentation and seminars in the lecture room"*

Instructors and lab assistant in the computer lab explained that the available computers in the lab are not proportional to the number of the students. Currently the undergraduate students were divided into five groups of 60 students each to share a total of 20 computers in the lab during their course. Moreover, the demand of students towards computer is increasing from time to time but the faculty is not working to address this problem. One of the instructors stated his feeling as;

> *"The number of students assigned to the faculty is increasing from year to year but the number of computers and computer lab is not changed or upgraded to full fill the demands of students."*

Gaps for using ICT

Majority of the key informant explained that there are two main gaps to use computers in the school as well as in the hospital. One of the reasons is that there is very limited access to computer at office as well as in their home. The other reason is lack of proper pre-service or in-

service training on ICT. Similarly, the recommendations suggested to fill this gap were provision of proper in-service training for the health care providers and appropriate skill training for the medical students during their stay in the university and ensuring reasonable access of computer at all levels.

Advantage of ICT in Medical profession

Most of the key informants give their explanation of the advantages of ICT in the medical environment into two broad categories. The first advantage is in the patients' side and the other is in the health care providers' side. With regard to patient, most of them agreed that it increases patient satisfaction by decreasing the patient waiting time by computerizing the service, improving the quality of service, keeping patients' privacy and confidentiality. Regarding health care providers by keeping them updated on their clinical knowledge, saving time lost by paper work it provides them adequate time for patient care, creates easy access for consulting seniors for quality service delivery through network, make learning system easy and palatable.

All of the students and instructors agreed that having knowledge and access to ICT facilities provide them a chance to be competent professionals in their area. To attain this goal majority of students mainly need to have computer skills like; proper Internet browsing technique, existing database use technique and some of the statistical analysis software like SPSS and EPI-Info. One of the students from the resident expressed his fear due to poor competence of computer skill as follows;

> *"I am a postgraduate student and at the end of the course data analysis or research work is a requirement; but I have no any idea how to analyze my data with the computer; we have no any class on data analysis using a computer."*

The existing ICT course in the Medical Faculty

The course is given at the 1st year (premed) for the interns and clinical year medical students and for nurses it was delivered at the 1st or 2nd year of study. No computer course is given at the resident level. The course provided to all undergraduate student is similar and it is *"Introduction to computer"* the topics included in this course were basics of computer, Ms-window and applications like word processing, PPT, benefits of Internet use and to some extent browsing of Internet.

Concerning the adequacy of the course delivered at the medical faculty, Informants explained that the course is given only once with two and three credit hours for nurses and medical doctor students respectively during their stay in the faculty. Most of the key informants agreed that the course provided is not adequate to acquire the necessary computer skill. In addition, the methodology of teaching focuses on the theoretical part. As it is said by the informant during the examination of the course more than 75% of the evaluation is theory.

Informants from residents and medical doctors proposed that the current course provided for undergraduate study in the faculty of medicine should be a continuation from their previous skill acquired from high school. This makes the course a little bit more advanced from their previous skill and helps them to apply the skill for their major course studies.

Majority of the respondents suggest that the credit hour should be increased and also a continuation from their high school skill. On top of this, the course should be delivered more than once for medical students during their stay in the faculty. This may help to incorporate more topics in the existing curriculum. One of the key informants from IT unit

proposed the following idea to support the incorporation of additional computer courses in the existing curriculum;

"Since computer learning is one of the skill based education it needs repeated exposure to acquire the required skill. So that, the course should not be graded rather it is better to make it simply Pass/Fail evaluation of the course. This may give chance for the faculty to provide additional computer courses for the medical students without increasing the number of credit hours in the existing curriculum."

Curriculum Revision issues

Computer course was considered as mandatory by some of the respondents in medical profession. Several reasons are stated by the key informants about the rationale of revising the existing curriculum for computer course. One of the arguments to revise the curriculum is in this day's most of the updated references for medical educations are available in electronic form. The other argument forwarded by the key informants was, now a day's computer skill is considered as main requirement to be employed in quite a lot of organization. One of the key informants from medical students forwarded his view of the future generation as;

"In my opinion through time skill of computer is considered as the main requirement for admission of universities as it is practical in most of the developed countries"

Key informants from health care providers and department heads proposed that in-service training should be considered for health care providers who do not have formal course in their basic education. On top of this, routine in-service training for specific skills should also be considered to health care providers for manipulating new digital equipments that require basic computer skill. With regard to methodology of teaching almost all of the key informants agreed that the practical session should be improved. Some of the practical aspects mentioned were

home take assignment, projects and visiting of computerized medical systems like the Korean hospital to have an overall vision on the automation of medical institutions.

Situation of the computer Lab in the Medical Faculty

Majority of the key informants agreed that the computer lab in the faculty is not comfortable for the teaching and learning process. The main problems identified by them were its crowded, limited number of computer; room is serving as a lecture room as well as lab session. On top of this, most of the computer hardware's were infected with virus and they are not frequently maintained or updated with antivirus. Regarding the Internet connection, almost all computers in the computer lab were connected but the speed is very slow and also not convenient to use personal computer (laptop) in the room due to the room set up and inadequate cable in the room. Informants explain that recently the problem of Internet connection was avoided to some extent especially for those who have laptop computer there is wireless network in two sites (Staff lounge and Undergraduate library). One of the key informants from ICT unit suggests a sort of future plan and his view to avoid the crowded situation of the medical faculty computer lab;

> *"It is better to prepare mini computer lab in each department dedicated only for the department members including students that will minimize the burden at the main computer lab actually this is part of our plan and we start some of the activities."*

Type of computer skill needed

Informants from undergraduate agreed that they need to have skill of basic computer applications like word processing, spreadsheet, powerpoint and Internet browsing technique. Where as informants from residents suggests that in addition to the above skills they need to have a skill of some statistical analysis software like SPSS, EPi-Info, online literature searching

technique and also skill of using databases especially designed for clinical activities. One of the informants from residents expressed her limitation of using statistical analysis software application as;

> *"When I finished my course work the department requires a research activity from me but I have no any idea about statistical analysis software and I don't know how I am going to analyze the data using a computer. For sure somebody will do for me."*

7. Discussion

In Ethiopia there is no as such study conducted assessing the knowledge, attitude and utilization of ICT among medical students. This study contributes as base line information on the knowledge, attitude and utilization of ICT among Medical students and health care providers. The study indicated that 24.9% of the respondents had satisfactory knowledge and majority of them were undergraduate and residents. Of which almost half of them 41.1% were interns and clinical year medical doctors and this may be due to their exposure from their high school stay. This figure is comparable with the finding from Nigeria teaching hospital where 18.9% of medical students and health care providers had good knowledge (10). However, this figure is less than the data obtained from the ICT penetration survey among HCPs in Addis Ababa and four towns of regions which was about 39% (6). Similarly, a study conducted in Zaria, Nigeria was also greater than this finding 50.6% of clinical year medical students (5).

In this study 56.7% of the respondents know basic ICT terminologies which are comparable with the study done in Tanzania College of Health Science, 52% of 4^{th} year clinical year medical students felt that they understood the basic terminologies and concept of computer (1). The study also showed that younger age groups are relatively better knowledge of ICT than the older one. The reason behind may be younger ages are more favorite to new technology than the older ages. In support of this finding, a study conducted in Nigerian teaching hospital showed that younger respondents tended to have better knowledge of computer and multiple accesses to Internet than older age (11). The study also indicated that males from gender category are superior in knowledge level than females. The result is consistent with other studies conducted in Nigeria and Yemen (11, 21).

The study revealed that 62.2% of respondents had different type of formal and informal ICT trainings; however, training status was not translated to better knowledge among the respondents who have different type of training, only 26.5% of them score above the 3rd quartile. Similarly, in a study conducted at Ile Ife university teaching hospital, only 26% of medical students and 27% of physicians had good knowledge after having different type of training (10). A study from Punjab, India also indicated that type of computer training received by the nurses does not influence the nurses overall computer knowledge (8). The possible reasons may be the type of training most of them had informal training less than 6 month and the time they received; majority of them took the training during their high school stay. On top of this, quality of the training, content of the training, mode of delivery, instructors' capacity, allocated time for theory and practical session during the training and gap between the training time and the actual use of computer are also contributing factors for knowledge status among those who had short term training.

This study showed that 67% of students had computer course in their current study. On the other hand their knowledge had no significant difference with those who had no computer course. These may be explained by the adequateness of the course and also the time the course is delivered. About 89.1% of medical students who took the course were not satisfied with the computer lab session. The in-depth interview also support this in which it is explained that the course delivered was simply introduction to computer in two and three credit hours and the allocated time for computer lab session was only two weeks.

In this study 51.7% of the total study subjects had at least one personal computer in their home. This figure is by far better than the result from ICT penetration in Ethiopia, computer access at home was reported by only 12% of the total respondents of HCP this may be the

cost of the computer in previous times and also most of the respondents in the current study were final year students especially residents who possess the larger proportion of personal computer (6). A survey of trainees in a Nigerian teaching hospital indicated the same figure, 51.7% of participants had personal computer (11). Similarly, the data from Aarhus, Denmark showed that 71.7% of first year medical students had access to computer at home (14). In contrast to this finding, a study in Tanzania showed that about 76% of the medical students having no computer at home (1).

The current study showed that possession of personal computer is one of the determining factors to have better score of basic ICT knowledge. In support of this study the finding from Nigerian teaching hospital indicated that ownership of personal computer is statistically significant association with knowledge of computer and longer duration of practice (11).

Access to computer in the Medical Faculty is very limited as disclosed in this study. The in-depth interview pointed out that no computer is dedicated for academic purpose in each department except in the computer lab. This explanation is similar with the study result from ICT penetration survey in Health sector of Ethiopia where it is stated as “accesses to the available computers in the health facilities were often limited to secretaries of facility officials” (6).

Internet access was found to be 74.8% of the study subjects. The most frequently mentioned place for Internet access was Internet café (46.6%). This finding is much better than the result from ICT penetration base line survey in Ethiopia where it is showed that only 26% had access to Internet. However, the place for Internet access is comparable with the current

study in that around 48% were accessed it at Internet café (6). In terms of access, this study is also better than a study conducted in Nigeria among first year clinical and nursing students in which around 60.7% had access to Internet and the common place of access is cyber café (87%) (13).

In this study 83.7% of all respondents had positive attitude towards Information Communication Technology. This finding is more or less comparable with the study conducted in Ludhiana, Punjab, India in which all the nurses (100%) had positive attitude towards computers in health care setting hospital (8). Similarly, a study done in Athrus, Denmark showed that majority of the first year medical students (68.4%) would like to replace traditional teaching with use of computers if possible and 88.1% of dental students in Egypt had also positive attitude towards computer (14, 22). Therefore, we can say that even if there is limitation in access to computer most of the medical students are willing to know about ICT facilities and also to use it for their academic purpose and health care delivery needs.

The highest level of competence reported by the study subjects were word processing 44.3%, email use 53.9% and Internet browsing 45.6%. Which was average and above competence of application skill. This finding is comparable with the study conducted in Nigeria and Tanzania word processing competence 60%, e-mail 75% and Internet 58% (1, 5). In addition, graphics and powerpoint competence is higher among residents because of the fact that their field requires a lot of presentations and seminars.

Regarding the way of acquiring skill, 67.3% of Internet browsing, 54.6% of graphics and powerpoint presentation and 45.7% of word processing skill was acquired by personal

effort. This result may be explained by most of the students use the word processing and powerpoint for report writing and preparing presentation and regard to internet majority of them use email. The study has similar result with the ICT penetration survey in Ethiopia, personal effort is the main method (67%) of acquiring ICT skill followed by short-term computer training (33%) and short-term in-house training (21%) among health care providers in Addis Ababa and four main regional towns (6). Comparably studies in Nigeria and Tanzania indicated that self effort contributes around 60% of the ways of acquiring skill and 68.9% in southern US medical university (1, 5, 20).

In this study 32.6% of study subjects were categorized under good utilization rate. Majority of the users were residents 52.3%. This is explained by the access level of computer among the respondents. Most of the residents have probably better income compared to the undergraduate students. This also reflected by their computer possession 93.3% of all residents had their own computer at home. Similarly, 33% of the health workers use computers for various purposes mainly for word processing and related activities (office tools) in ICT penetration survey of Ethiopia and in Zaria, Nigeria 26.7% of medical students utilize computer of them 60% comfortable in word processing (6,5). In contrary to this, finding the study conducted in Chennai, India 94% of both undergraduate and post graduate students were found to utilize the computer for desktop usage. The Postgraduate medical students were found to use the computer more frequently as compared to undergraduate medical students (9).

This study indicated that Internet is used by 87% of respondents and 80.4% of the study participants had email address for their mail communication. The email was the most common application used (90.1%) followed by research and education (66.1%) in this study

samples. Similarly, a study conducted in public medical school of the southern United States in 2000 showed majority of students had used email (97%), educational software (75%) and conducted literature search (88%) (20). The study also concordant with the result from Nigeria where 76.4% of first year clinical and nursing students in Ibadan (13) and 75% fourth year medical students in Dare-Selam, Tanzania (1) have used email. The explanation for poor Internet use among students for academic purpose may be due to the fact that Internet connection is poor, slow and high cost in the Internet café. This makes difficult to download literatures and other documents from the Internet. As a result, most of the students inclined to use hardcopy for their education as a text or reference. Regarding the email service it is possible to be served with low level Internet connection in the Internet cafes.

The study also pointed out that computer possession is one of the main factors that resulted in better utilization status of students. Accordingly, 53.6% of respondents of those who have personal computer had better ICT utilization status. A study in Nigeria and New Jersy, Startford university of medicine showed that ownership of personal computer is highly associated with longer duration of practice (11,24). There are various reasons for not using computers and the Internet. Of which lack of access to ICT facilities, inadequate training and high cost are among the major constraining factors. (6, 21)

In this study it is indicated that knowledge of respondents are one of the driving factor of utilization of ICT among students in the academic as well as in the health service delivery needs. Among respondents who had good knowledge 52% of them use computer satisfactorily. Likewise a study conducted in Helsinki, Finland demonstrated that basic computer skill was highly associated with utilization of ICT facilities (23).

From the in-depth interview it is indicated that majority of the key informants explained that, students in the medical faculty needs to have competence of computer skill like statistical analysis software and online literature searching. In consistence with this finding a study in Hadramout university of Yemen showed that 74.3% of medical students need to be provided with training on online literature searching (21).

8. Strengths and Limitations of the study

8.1. Strength of the study

- Combination of qualitative and quantitative study design to complement each other.
- Since it is one of the few studies in this area it provides baseline information for those interested.
- Including both medical students and health care providers as study subject

8.2. Limitations of the study

The limitation of this study includes:

- Lack of similar studies especially in Ethiopia to make comparative discussion.
- Presence of incomplete questionnaires
- Minimal response rate among physicians
- Possibility of social desirability bias by considering their status
- Health care providers are underrepresented in the study that hindered further analysis

9. Conclusions

To design proper interventions of improving the awareness and utilization of ICT in the medical institutions and health care delivery system, it is worth to assess the knowledge, attitude and utilization of medical students and health care providers. Such kind of empirical investigation can be a spring-board for the appropriate interventions like curriculum revision or in-service training.

The results of this study have important implications for the knowledge and utilization status of health professionals in the medical institutions and health facilities.

- The study indicated that majority of the medical students and health care providers had low level of basic ICT knowledge and only half of them are familiar with the basic ICT terminologies.
- Majority of the respondents have received formal or informal ICT training, however their training did not differentiate them from those who have no training in the basic knowledge of ICT.
- Almost all of the study subjects have positive attitude towards ICT and willing to have the appropriate skill for their academic purpose as well as for their future carrier.
- Ownership of personal computer at home was found to be one of the determining factors to have better knowledge of computer.
- Almost all of the undergraduate students who received the ICT course were not satisfied with the course and uncomfortable with their computer lab sessions.
- Possession of personal computer was relatively better among residents which helped them to have relatively better utilization rate compared with the other groups.

- The younger age groups had more likely to have better knowledge attitude and utilization of ICT applications compared to older ages.
- The study showed that access to computer and other ICT facilities is positively associated with participants' knowledge and utilization of computer. However, access to ICT facilities in the medical faculty was very limited and there is no computer dedicated for academic purpose in each department.
- Internet access was limited at Medical Faculty and majority of the respondents' access in the Internet café mainly for email service.
- The highest level of competence, reported by the study subjects were word processing and Internet browsing for email service and most of them acquired it through personal effort.
- Computer possession is one of the main factors that resulted in better utilization status of respondents.
- In this study knowledge on basic ICT is found to be one of the contributing factors for using the existing ICT facilities among undergraduate and postgraduate students in AAU, Medical faculty.
- There are various reasons for poor utilization of computers and the Internet. Of which lack of access, inadequate training of ICT and high cost appeared to be the major constraining factors.

10. Recommendations

Based on the study findings and the above conclusions the following short term and long term recommendations are forwarded;

Short term

- The existing computer course in the curriculum should be strengthened interms of content, credit hour, mode of delivery and computer lab sessions to make it more skill oriented.
- Computer skills like statistical analysis, online literature searching technique and using existing clinical database systems should be provided to medical students and residents during their stay in the medical faculty.
- Formal in-service training on basic computer application should be provided for the health care providers working in the hospital.
- The medical faculty and the hospital should consider Internet access for students and health care providers.
- Departments should have computers connected to Internet and dedicated for academic purpose for residents and physicians.
- There should be easier access to computers, especially in libraries, in order to encourage students to use computer applications for research purposes. Library of the Medical Faculty should be able to subscribe more online resources.
- Lack of significant difference between trained and non trained participants' in terms of ICT knowledge should be further investigated.

Long term

- Resources should be allocated from the government to better develop the ICT infrastructure in the medical faculty, hospitals and other health facilities.
- FMOH should develop clear guideline and strategies on the need of ICT in the health system
- The current computer knowledge and utilization of medical students and HCPs should be revisited in terms of the new HMIS initiative requirements in order to create better balance in the long run.
- Large scale capacity building of health care providers should be considered in line with the HMIS implementation.
- Further study should be conducted to determine the influencing factors for acquiring skill and utilization of ICT among health care providers in the health system.

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12. Annexes

Annex 1. Questionnaires

Addis Ababa University
Faculty of Informatics

Health Informatics Program

I am Melsachew Adane, a post-graduate student in Health Informatics at Addis Ababa University Faculty of informatics. Currently I am doing a Masters thesis entitled as *"Assessment of Knowledge, Attitude and Utilization of Information Communication Technology (ICT) among medical students and Health Care providers"*.

The objective of this self administered questionnaire is to collect data from medical students on their knowledge, attitude and utilization of ICT during their stay in the medical institution. In line with this, it helps to obtain data on the means of acquiring ICT knowledge and access to computer. It will take about 30 minutes to fill the questioner. You are selected to participate in this study just by chance. The information you provide us is extremely important and invaluable, as it will help the governmental and private institutions involved in training of health professionals for revision of curriculum as well as teaching methodology.

I would like to assure you; the information that you provide me is completely confidential and will be used only for the research purpose. You have full right to refuse to take part or to stop filling the questioner at any time. But the information that you will provide is quite useful to achieve the objective of the study and to contribute for revision of curriculum and teaching methodology.

Considering the information you get from the general information above, I would be thankful if you spend some time to answer questions related to the issues.

Thank you for your willingness to participate in this study.

Name of data Collector _____	Name of Supervisor_____
Signature_____	Signature_____
Date_____	Date_____

Addis Ababa University
Faculty of Informatics
Health Informatics Program

Self administered questionnaire on Knowledge, Attitude and Utilization of ICT among medical students attending their medical education at AAU Medical Faculty.

PART I – Demographic characteristics

Instruction: In this section please encircle the number in front of the choices that exactly fits your status out of the list.

NO	Questions	Categories	Skip
101	What is your age?	_____Years (age in completed years)	
102	What is your gender?	Male--------1 Female-----2	
103	Where did you finish your high school? *(this is only for undergraduate students)*	----------(Write the name of the school and the town)	
104	Which category of study do you belong?	Undergraduate------1 Post graduate-------2	➔**106**
105	If you are undergraduate student, what is your year and field of study?	Internship----------1 clinical Year-1---------2 clinical Year-2---------3 Final year nursing------4	
106	If you are postgraduate student, what is your field of study?	Internal Medicine----------1 Surgery----------2 Pediatrics--------3 Obstetrics & Gynecology-------4 Radiology---------5 Dermatology--------6 Ophthalmology--------7 Neurology--------8 ----------Other--------99	

PART II. Knowledge

Instruction: For the True/False questions please encircle 1 if you think the statement is true or encircles 2 if the statement is false. For others, follow the instruction just below the question

NO	Questions	Categories	Skip
201	Which of the following are secondary computer data storage tools? *(encircle as much as you know)*	Compact Disk----------1 Floppy Disk----------2 Mouse----------3 Flash Disk (USB)---------4 Key board----------5 Monitor----------6 Server----------7 DVD----------8 RAM----------9	
202	A digital Computer does its computation using binary systems (0 and 1)	True----1 False---2	
203	A Compact Disk (CD) is hardware	True----1 False---2	
204	The CPU is a hardware	True----1 False---2	
205	Communication between PCs Made by different Vendors is impossible	True----1 False---2	
206	Only data put in the a data base form can be accessed using a network	True----1 False---2	

207	Digital sound and video can be communicated over a network	True----1 False---2	
208	According to coverage a computer network can be Local Area Network (LAN), Metropolitan Area Network (MAN), Wide Area Network (WAN)	True----1 False---2	
209	Networks allow different Personal Computers (PCs) to access the same files	True----1 False---2	
210	The global Network of Networks is called the Internet	True----1 False---2	
211	E-mail is the fastest and secured mode of mail communication	True----1 False---2	
212	An organization can have an Intranet mail system	True----1 False---2	
213	WWW stands for World Wide Web	True----1 False---2	
214	A floppy Disk has a larger capacity than the Compact Disk	True----1 False---2	
215	RAM is a permanent memory in the computer	True----1 False---2	
216	A modem allows computers to communicate using telephone line	True----1 False---2	
217	People who work at home can communicate with their office using the modem for their Internet connection.	True----1 False---2	

218	Please select terminologies that you confidently know their meanings from the list (encircle as much as you know their meaning)	Icon----------1 Hyper text link----------2 Button----------3 Dial up connectivity----------4 Online communication-------5 Hardware----------6 Tool bar----------7 Internet account----------8 URL----------9 Website----------10 System unit----------11 Browser----------12 Folder----------13 Menu----------14 Search engine----------15 Software----------16 Computer viruses----------17 Operating system----------18 Windows environment----19 Formatting disks----------20	

PART III- Access and Attitudes towards ICT

Instruction: Please encircle the answer from the list under the categories that best describes the question

NO	Questions	Categories	skip
301	Have you had any formal training/education in computer/ Information Technology?	Yes-------1 No-------2	➔**303**
302	If yes, indicate which category of training/education you took?	(< 6 months) Short course --------1 (6 month – 1 Year) Certificate----2 Diploma----------3 Degree----------4	
303	Do you have a personal computer?	Yes --------1 No --------2	➔**305**
304	If yes, which type?	Desktop ----------1 Laptop ----------2 Palm top----------3 PDA----------4	
305	Do you enjoy working on the computer?	Yes ---------1 No ---------2 Not sure------3	
306	Do you have access to electronic documents in a form of CD- ROM, Magnetic tape on your field of specialty *(This may be in the library)*	Yes ----------1 No ----------2	
307	Do you have Internet access	Yes-------1 No-------2	➔**310**

308	If yes, where do you access more commonly	Home-----1 Office-----2 Internet Café------3 ---------Other specify---99	
309	Do you have access to medical journal/organization subscription online	Yes------1 No-------2	
310	Are you aware that Telemedicine service is to be provided at Tikur Anbessa hospital?	Yes--------1 No---------2	➔**312**
311	If yes, did you visit the center formally	Yes--------1 No---------2	
312	Have you taken a computer course in your current study?	Yes------1 No-------2	➔**316**
313	If yes, in which year of education? *(Write simply year of the course delivered)*	----------th year of study	
314	Do you have a computer lab session during your computer course	Yes-------1 No--------2	➔**316**
315	If yes, Are you satisfied with the practical session in terms of the number of computers, time for exercise and help from the lab assistant?	Yes------1 No------2 Not sure-----3	
316	Do you think information technology has a role in your profession?	Yes ----------1 No ----------2 Not sure----------3	

317	What information/Knowledge resources do you use for reference in your studies (Choose all that can apply to you)	Text books----------1 Photocopies of textbooks----------2 Lecture notes made by self----------3 Lecture notes made by instructor----4 Videos----------5 Electronic text books----------6 Journals----------7 Online journals----------8 ----------(Others) specify------99	
318	Have you ever used a computer-assisted learning package? *Hint: learning packages through CD-ROM, Online Education, Video conferencing, etc...* (Please choose as appropriate)	Yes, In high school----------1 Yes, at home----------2 I have never used a computer assisted learning package-3 I have never heard this term before—4	
319	Which of these statements best describes the way you feel about computer?	I feel very confident using computer—1 I feel I can cope---------2 I am completely lacking in confidence----3	

PART IV: Skill and Utilization

1) Assessment of your ICT Skills. (Please complete the table below by ticking "✓ "in the appropriate boxes)

NO	Skills	Your Competence of computer skill (Tick ONE box for each skill)				If your response for the competence is Basic/Average/Advanced. Please, tick where do you acquire the skill			
		None (1)	**Basic (2)**	**Average (3)**	**Advanced (4)**	**High School (1)**	**University/College (2)**	**Work Place (3)**	**Self/Home (4)**
401	Using Microsoft word application								
402	Spreadsheets (Excel)								
403	Graphics (like Microsoft picture) Presentation (like Powerpoint)								
404	Internet - World Wide Web								
405	E-mail								
406	Databases use (an existing database)								
407	Conducting basic maintenance (like formatting, install software)								
408	Databases design (set up a database)								
409	Programming								

NB: **None:** If you never operate the application program like Micro soft Office (Word, Excel, PPT etc...)

Basic skill: If respondents able to open the program and able to do some of the MS office program of the specified computer applications

Average skill: If respondents having the basic and developed additional skills including the use of different software programs and able to operate the specified computer application regularly for office or academic purpose.

Advanced skill: If Respondents knowledgeable of hardware and software and able to operate the specified computer application beyond the routine office application like troubleshoot, advise and teach others.

2) Utilization of the available ICT infrastructure

Instruction: Please select from the list and encircle the corresponding number according to the instruction under each question.

NO	Questions	Categories	Skip
410	Have you ever used a computer? (If yes, how often) *(Choose one only)*	Yes, Almost every day----------1 Yes, Once a week----------2 Yes, Once in two weeks----------3 Yes, Once in a month or more------4 Never used a computer----------5	 ➔**422**
411	When did you use a computer for the first time? *(Please answer in either month or years)*	----------months ago or ----------years ago	
412	When have you used computer last time	Yesterday----------1 3 days before----------2 A week before----------3 A month before----------4	
413	Have you used a computer as part of a course at school, college or university	Yes----------1 No----------2	
414	Do you have an email address?	Yes----------1 No----------2	
415	Do you use the Internet?	Yes----1 No----2	 ➔**420**
416	If yes, where do you use the Internet more commonly	Home-------1 School---------2 Internet Café--------3 ----------Other specify—99	

417	What do you use the Internet for?	Mail----------1 Research/Education-------2 Film/News------3 Forum online------4 File transfer---------5 Chatting----------6 Game----------7 ----------Others (mention)-------99	
418	How often do you use the Internet?	Occasionally----------1 Once per week---------2 2-3 times per week----------3 4 and more times per week---------4	
419	Do you use medical journal/ organization subscription online?	Yes---------1 No---------2	
420	Have you ever produced a presentation using powerpoint tools yourself?	Yes---------1 No---------2	**➔422**
421	If yes, how many times have you produced a presentation?	Once----------1 2- 3 times------3 More than three times-------3	
422	How many times have you participated in video conferencing?	None----------1 Once----------2 Twice / more-------3	

Thank you for your patience to complete this questionnaire!!

Annex 2. Guideline for in-depth interview

Introduction

- Information Communication Technology (ICT) is playing a vital role in the medical education and practice of the developed world. But it is lagging behind in the health professional training as well as during health care delivery of the developing countries including Ethiopia. Hence all health professionals are expected to have the necessary computer skill during their stay in the medical institution
- Providing the basic computer courses as part of the pre-service training is crucial in order to give access for the students online reference materials, as well to ease their way of education during their training time. And helps the students to be competent service providers after graduation by proper utilization of the available ICT infrastructure.
- Therefore the aim of this assessment is generation of valuable base line information and factors influencing the skill of ICT among medical students that will help to develop a feasible plan of action to strengthen health professionals' computer training components in the pre service education of medical students.

1. In-depth interview guide for Department heads

Main Topics

- How do you see the status of the existing ICT knowledge attitude and skills of medical students in the faculty?
- How is the accessibility of computer for the instructors as well as for the medical students?
- Do you know the ratio of computer – to- student in the faculty?
- At what year will the computer course is given for each category of medical students?
- How suitable is the computer labs and other facilities room set up for effective skills learning? If not what are the critical teaching learning materials, equipments and facilities lacking?
- In your assumption is the course given enough for the medical students to acquire the necessary ICT skill, especially for online reference data entering and processing.
- How many computers are in the computer lab, how many of them are connected with the Internet?
- In your department mainly for what purpose the medical students as well the instructors use the computer?
- How many PCs in your office are dedicated for academic purpose?
- Do all the department members have PC in the office?
- Are all the Pcs Internet connected or proportion of the connected one?
- Mainly for what purpose the physicians use the Internet?

- What type of computer skill/ competence do you need to know?
    - Curriculum revision (type of courses and methodology of teaching)
- Advantages/ benefits of ICT/ Health information system
- What are the main challenges to improve the computer education for the medical students?
- What strategies would you recommend for the incorporation of computer courses from the existing curriculum?
    - What are the opportunities and threats of the proposed strategy
- Is there any policy/guideline to support/ incorporate the computer course in the existing curriculum?

Any other points and recommendations

Thank you for taking the time to conduct this interview!!

2. In-depth interview guide for Medical students

Main topic:

- How do you see the status of the existing ICT skill of medical students in your faculty?
- How is the accessibility of computer for students in the medical faculty?
- In your assumption is the course given in your stay at the medical faculty is enough to acquire the necessary ICT skill
- How many computers are in the computer lab, how many of them are connected with the Internet during your lab session?
- In your department mainly for what purpose the medical students use the computer?
- Is the ICT course delivered at the appropriate time?
- Mainly for what purpose the medical students who have access use the Internet?
- What strategies would you recommend for the incorporation of computer courses from the existing curriculum?
- How suitable is the computer labs, facilities and room set up for effective skill learning? If not what are the critical teaching learning materials, equipments and facilities lacking?
- Do you think the curriculum of medical education should be revised especially for the incorporation of ICT courses?
- What type of computer skill/ competence do you need to know?
- Curriculum revision issue (type of courses and methodology of teaching)
- Advantages/ benefits of ICT/ Health information system

Any other points and recommendations

Thank you for taking the time to conduct this interview!!

3. In-depth interview guide for Health care providers

Main topic:

- How do you see the status of the existing ICT knowledge attitude and skills of Health care providers in the Hospital?
- What is your opinion on the role of Information Technology on health? How it will apply to improve the health care provision.
- How do you see the accessibility of computer for the health care providers in the hospital?
- Did you take any in service training on computer while you are in the hospital?
- What do you think your gap to use computer in your working environment? And what do you recommend to fill this gap.
- Do you have computer in your office? If there is computer mainly for what purpose do you use it?
- Is the computer in your office Internet connected? If so mainly for what purpose do you use the Internet?
- In your assumption what are the main challenges of the health workers in the hospital not using the computer?
- What are the opportunities to provide/implement Information Technology in the hospital?

- Any other points and recommendations

Thank you for taking the time to conduct this interview!!

Declaration

I, the undersigned, declare that this thesis is my original work in partial fulfillment of the requirement for the Degree of Masters of Science in Health Informatics and has not been presented for a degree in this or any other university. All source of materials used for this thesis and all people and institutions who gave support for this work have been duly acknowledged.

Name: **Melisachew Adane**

Signature: _____

Place: **Health Informatics Program, Faculty of Informatics**,

Addis Ababa University

Date of submission: **14th July, 2009**

This thesis has been submitted for examination with our approval as the university advisors.

Name of the advisors	**Signature**
Lemma Lessa	_____
Dr. Solomon Shiferaw	_____