

How knowledgeable are Medical Doctors of Public Health Ethics? A self-assessed cross sectional survey in a developing country

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Abstract

Public health ethics involves what constitutes good or bad behaviour for health professionals physicians inclusive in discharging public health duties. It is anchored on the principles of beneficence, nonmaleficence, autonomy and justice. However, knowledge of physicians on these core ethical issues has not always been clear which constituted the reason for this study. This was a cross sectional study conducted amongst 203 medical doctors at the University of Nigeria Teaching Hospital. All the doctors were included in the study. However, 140 doctors filled and returned their questionnaires giving a response rate of 68.9%. Both descriptive and inferential statistics were used in the analysis. Overall, 41.4% of the doctors had knowledge of public health ethics above average. In age ($p = .011$), present rank ($p = .006$) and area of specialty ($p = .012$), there were significant differences among groups. In age, knowledge of autonomy was associated more to doctors aged 45 years and above (82.4%). In present rank, knowledge was associated more to consultants (100.0%). In area of specialty, knowledge was associated more to community health doctors (90.6%). In present rank, consultants (3.86 ± 0.38) had the highest overall knowledge of public health ethics. A Post Hoc test revealed significant difference in overall knowledge of public health ethics between community health doctors (2.78 ± 0.61) and paediatricians (1.93 ± 0.72) and between community health doctors (2.78 ± 0.61) and obstetricians and gynaecologists (2.16 ± 0.90). Given that 58.6% had knowledge of public health ethics below or less than average shows a need for improvement.

Key words: Public health, ethics, doctors, knowledge, beneficence, nonmaleficence, autonomy and justice, Nigeria

Background

The word ethics has Greek roots: referring to philosophical inquiry into good and evil. A Code of Ethics is an attempt to define basic rules, or principles for determining what constitutes "good" or "right" behaviour (Burns, 2012). In other words, to determine what we *ought* to do next. Ethics is

“The discipline of dealing with what is good and bad, and with moral duty and obligation. Ethics could as well be defined as a set of moral principles or values and could also mean the principles of conduct governing an individual or group (Burns, 2012). According to Beaglehole and Bonita (Royo-Bordonada and Román-Maestre, 2015; Beaglehole and Bonita, 1998), public health is one of the collective efforts organised by society to prevent premature death, disease, injury and disability, and to promote the health of populations. A similar definition, drawn up by Acheson ((Royo-Bordonada and Román-Maestre, 2015; Acheson, 1988) was adopted by World Health Organisation (WHO) and states that public health is the art and science of preventing disease, prolonging life and promoting health through the organised efforts of society. The United States (U.S.) Institute of Medicine notes that public health is something that not only concerns public agencies, but also concerns private organisations and communities of individuals, and lays emphasis on assuring a healthy environment, namely, public health is what we, as a society, do collectively to assure the conditions in which people can be healthy ((Royo-Bordonada and Román-Maestre, 2015; Committee for the Study of the Future of Public Health, 1998. The United Kingdom (UK) Faculty of Public Health has gone one step further, by incorporating the concept of well-being into the definition, specifying that public health is the science and art of promoting and protecting health and well-being, preventing ill-health and prolonging life through the organised efforts of society ((Royo-Bordonada and Román-Maestre, 2015; UK Faculty of Public Health, 2014).

The mandate to ensure and protect the health of the public is an inherently moral one. It carries with it an obligation to care for the well-being of communities and it implies the possession of an element of power to carry out that mandate. The need to exercise power to ensure the health of populations and, at the same time, to avoid abuses of such power is at the crux of public health ethics (Thomas et al; 2002). Until recently, the ethical nature of public health has been implicitly assumed rather than explicitly stated. Increasingly, however, society is demanding explicit attention to ethics. This demand arises from technological advances that create new possibilities and, with them, new ethical dilemmas; new challenges to health, such as the advent of HIV; and abuses of power, such as the Tuskegee study of syphilis (Thomas et al; 2002). The emerging interest in ethical issues in public health research and practice reflects both the important societal role of public health and the growing public interest in the scientific integrity of health information and the equitable distribution of health care resources (Nurunnabi et al; 2010). Ethical concerns in public health often relate to the dual obligations of public health professionals to acquire and apply scientific knowledge aimed at restoring and protecting the public's health while respecting individual autonomy (Nurunnabi et al; 2010; Coughlin et al.; 2009). Public health professionals must go through the steps of an ethics analysis to assure the public of their integrity. The public must feel confident that public health professionals will offer only those proposals that will improve the health of the public, that proposed measures are minimally burdensome, and that a fair procedure has determined that the magnitude of the problem and the ensuing benefits justify overriding conflicting moral claims (Nurunnabi et al, 2010; Kass, 2001).

At the helm of public health practice and ethical decision making are Medical Doctors who work alongside other health care providers in protecting the public from all kinds of diseases. They practise to ensure and assure the public that recommended medical procedures and choices made

are of public interest and individual protection. But questions remain as to how knowledgeable the doctors are of public health ethics to enable them make the right decisions in the process of providing care to the general public in disease prevention and management. This work is organised to providing answers to these questions.

Preminent in public health ethics and basis of this study are the principles of beneficence, no maleficence, autonomy and justice. These principles will be examined against doctors' understanding and application in public health practice and ethics. As explained by Beauchamp (Nurunnabi et al, 2010; Beauchamp and Childress, 2001), these principles seek to reduce morality to its basic elements and to provide a useful framework for ethical analysis in the health professions. However, those principles do not provide a full philosophical justification for decision making. In situations where there is conflict between principles, it may be necessary to choose between them or to assign greater weight to one. Practical problems in public health ethics require that these principles be made more applicable through a process of specification and reform (Beauchamp, 2009).

Beneficence and Nonmaleficence which are often treated together see doctor's duty to patient as Hippocrates directed, "Be of benefit and do no harm." This represents the clinician's duty to improve the patient's physical and psychological health with a favourable benefit-to-risk ratio (FIGO, 2012). This requires considering prospective advantages of a treatment option, weighing the side effects or consequences that could cause harm, and assessing the advantages for the patient adequately to exceed the disadvantages. The practitioner must ask what clinical needs are present, and how the choice of actions will address them to the benefit (good) of the patient (FIGO, 2012). The principle of non-maleficence – do no harm – asserts that a health care professional should act in such a way that he or she does no harm, even if her or his patient or client requests this (Schröder-Bäck et al; 2014, Beauchamp and Childress, 2009) . This principle is the first to be proposed because of its historical antecedence; it is related to the famous Hippocratic 'primum nil nocere' – first of all, do no harm' of medical ethics, although not identical to it (Schröder-Bäck et al; 2014; Beauchamp and Childress, 2009; Jonsen, 1977; Smith, 2005).

The obligation to produce benefit, for individual patients or clients, is intimately connected to non-maleficence. Its apparently self-evident importance marks it out as the other core principle within the Hippocratic tradition: physicians should heal and help their patients, according to the physician's abilities and judgment (Schröder-Bäck et al; 2014; Beauchamp, 2007). The distinctive difference between the principle of non-maleficence on the one hand and that of beneficence on the other lies in the fact that the former frequently – but not always – involves the omission of harmful action and the latter active contribution towards the welfare of others (Schröder-Bäck et al; 2014; Beauchamp and Childress, 2009). One way of conceiving of the moral impulse of beneficence in public health terms is therefore to understand the ethical imperative to produce benefit in a wider sense and to talk of the obligation to 'social beneficence' (Schröder-Bäck et al; 2014).

The principle of Autonomy is often phrased around the duty to respect individuals' right to choose which health care interventions are acceptable to them. It does not imply that there is a duty to offer health care interventions that are not medically sound or indicated just because a patient wants them. That is, autonomy is the right to choose among indicated and reasonably available options, not the right to receive any treatment the patient wants. Autonomy also includes the right

to choose to have others involved in decision-making, such as family and community members (FIGO, 2012). The paternalistic benevolence contained in the principles of non-maleficence and beneficence is strongly tempered by the emphasis on respect for the autonomy of the patient who the health care professional is seeking to serve (Schröder-Bäck et al; 2014; Beauchamp and Childress, 2009; Veatch, 2000). The principle of respect for autonomy extends, however, beyond the confines of individual health care; it is crucially important within the public health context. The frequent focus of public health on benefit for populations holds the potential for concern with individual welfare to be side-lined (Schröder-Bäck et al; 2014). And this should be discouraged as rather individual welfare is within this autonomy frame work.

Justice addresses what entitlements are due to individuals for their health care. The right of individuals to fair and equitable distribution of the benefits and the risks or burdens of available health care (FIGO, 2012). The scope of potential ethical issues involving justice extends far beyond the immediate concerns raised by the one patient in front of us. Justice demands that we consider the formulation of health care systems and the extent to which they provide fair access and benefits (FIGO, 2012). It is equally possible to conceive of the principle of justice (sometimes ‘social justice’) as having grounds in the fundamental value of human autonomy. Because as humans we all have (or should have) autonomy, we all have (or should have) equal moral worth. Thus, proposals for the unequal treatment of people again require the burden of proof. Justice, to the contrary, demands equal opportunities. This also includes a fair distribution of health outcomes in societies, which is often discussed in terms of public health as ‘health equity’ (Schröder-Bäck et al; 2014). In a very prominent conception of justice in the context of health, Daniels (Schröder-Bäck et al; 2014; Daniels, 2008) considers health equity thus a matter of fairness and justice. Under Daniels’ conception of justice, health inequalities are unfair and unjust – and thus in conflict with health equity – if the socially controllable factors that lead to health are not distributed in such a way that the health of all citizens is protected or restored as much as possible.

There is paucity of researched information on the knowledge of medical doctors concerning public health ethics; however a few results were obtained. The summary of findings from a Nigerian tertiary hospital inquiry into how knowledgeable physicians are of public health ethics shows an appreciable difference in the knowledge base of junior doctors (house officers, medical officers and registrars) when compared to the more senior ones (senior registrars and consultants) with statistical significance especially for the core ethical principles, i.e., beneficence, non-maleficence, and justice in favour of the latter (Fadare et al, 2009). A similar inquiry indicates that the knowledge scores for public health ethics were low for both the faculty and the house officers in a medical college environment. However, the faculty was significantly more confident than the house officers regarding ability to address ethical issues. Seventy-five percent of the faculty and 65% of the house officers believed that ethics training should be mandatory during residency (Sulmasy et al; 1995). Results from the Caribbean indicate that medical students generally attested to the importance of ethical knowledge but felt that they knew little of the law. Students varied widely as regards the frequency with which they saw ethical or legal problems, with a quarter seeing them infrequently, but another quarter seeing them every day (Walrond et al, 2006). They received their knowledge from multiple sources and particularly from lectures/seminars, and found case conferences the most helpful. Only a few students felt that text books had been helpful (Walrond et al, 2006). Students were generally knowledgeable about most ethical issues, but many had uncertainties on how to deal with religious differences in treating patients, on the information

to be given to relatives, and how violent patients should be treated (Walrond et al, 2006). A Pakistani study on knowledge, attitude and practice of medical law and ethics among doctors shows that there was a general unawareness regarding medical law and ethics among all levels of respondent doctors. Physicians had poor knowledge regarding autonomy and gave mixed responses about patient's rights when the questions were differently phrased (Quratul, 2013).

In spite of medical doctors being pivotal to achieving improved public health practice and the ethics involved in the delivery of health care in Nigeria and also the government identifying the prominent role public health ethics ensures in equity, fairness, protection and distribution of public and individual health care, there has been little research that systematically analyses whether medical doctors understand and duly apply ethical practices in public health. This paper aims to evaluate doctors' understanding and application of public health ethics in providing individual and community care in our society. It is hoped that the information gathered will help in the designing and delivery of appropriate strategies on enhancing the practice of public health ethics among our doctors so as to optimize the associated benefits accruing from such knowledge and practice.

Methods

This was a cross sectional study conducted amongst doctors at the University of Nigeria Teaching Hospital in Enugu, Enugu State of Nigeria. The University of Nigeria Teaching Hospital (UNTH) began early in the 20th century as a standard general Hospital for Africans built by the colonial administrators. It later metamorphosed into a general hospital on the attainment of Nigeria's independence in the 1960's. However, at the end of the Nigerian civil war in 1970, the then government of East Central State transformed it into a Specialist Hospital with effect from July 1, 1970. At this time, the hospital had a total of 50 doctors, 10 wards, and 300 beds and a chest bay of 60 beds. There are also 350 nurses working in the Hospital. Today, the situation has changed dramatically. The bed capacity of the hospital in the permanent site is over 500 beds and the number of its personnel (professional and non-professional) has increased tremendously. There are nine training schools/programmes in the hospital viz: the School of Nursing, Midwifery, Medical Laboratory Science, Nurse Anesthetists, Community Health and Post Ophthalmic Nursing. Others are Peri-Operative Nursing, Cardiothoracic Nursing and Medical Records (LOGBABY.com).

Study Population

The sample population for this study comprised of all the Medical Doctors in the University of Nigeria Teaching Hospital who were two hundred and three (203) in number as at the time of this study and includes: house officers (interns), medical officers, resident doctors (registrars and senior registrars) and consultants. Medical officers are post-internship doctors who are yet to commence residency training.

Sample population and Sample size

The University of Nigeria Teaching Hospital as at the time of this study in February, 2016 comprised of two hundred and three (203) medical doctors with different designations as house officers, medical officers (registrars, senior registrars) and consultants. Due to the manageable size of the sample population, all the doctors were included in the study. However, only one hundred and forty (140) doctors were able to fill and return their questionnaires giving a response rate of

68.9%. The questionnaire was made up of two sections: A and B. Section A focused on the respondents' bio-data such as age, rank and gender. Section B focused on the respondents' public health ethics knowledge and practice. The response distribution was as follows: house officers (56), medical officers (21) registrars (40), senior registrars (15) and consultants (8).

The instrument was face validated by three researchers from the Faculty of Health Sciences and Technology, University of Nigeria, Enugu Campus. They were presented with the topic, purpose of the study, research questions and hypotheses of the study. They were requested to examine the entire items on the study instrument and determine their appropriateness, adequacy and clarity with reference to the purpose of the study, research questions and hypotheses.

Methods of Analysis

Both descriptive and inferential statistics were used in the analysis of this work. The descriptive statistics- frequency and percentage were used to summarize the items on demography of the doctors and their knowledge of the different public health ethics. The inferential statistics- Chi-Square Test for Homogeneity of Proportion, Mann-Whitney U-test and Kruskal-Wallis H Test were used. The Chi-Square Test was used for between groups significant test of any two variables of categorical data. The Mann-Whitney U Test and Kruskal-Wallis H Test were used for between group's significant test of any two variables of numerical data and categorical data. The U test was for categorical data of two groups while the H test was for more than two groups. The U test also served as a Post Hoc test for the H test, although with Bonferroni's correction. The data (knowledge score) for U test and H test were generated by scoring each participant 1 mark for each correct knowledge and taking the sum of the scores. Normality of the score was not met which resulted to the use of U test and H test. A logistic regression was also performed on the data. The demographic data served as the predictors while the knowledge score categorized into binary variable served as predicted variable. These statistical techniques were done using the IBM SPSS version 20.

Results

Tables

Table 1: Characteristics of the Participants

n = 140

	Categories	Frequency	Percent
Age	25-34 years	69	49.3
	35-44 years	54	38.6
	45-54 years	10	7.1
	55+ years	7	5.0
Gender	Male	85	60.7
	Female	55	39.3
Present rank	House officer	56	40.0
	Medical officer	21	15.0
	Registrar	40	28.6
	Senior registrar	15	10.7
	Consultant	8	5.7

Area of specialty	Community health	32	22.9
	Surgery	23	16.4
	Internal medicine	31	22.1
	Paediatrics	28	20.0
	Obstetrics & Gynaecology	26	18.6
Knowledge source of code of medical ethics	Undergraduate medical school	128	91.4
	Internet and medical journals	12	8.6
	Continuous medical education	0	0.0
	Extra courses	0	0.0
	Post graduate medical school	0	0.0
Knowledge of the supervising body of all medical ethics issues	Correct (National Health Research Ethics Committee)	82	58.6
	Incorrect	57	40.7

Missing data exists in item if total frequency is less than 140

Table 1 displays the demographic data of the participants. Most of them were aged between 25-44 years (87.9%). Males (60.7%) were more than females (39.3%). Greater part of the participants were house officers (40.0%) followed by junior registrars (28.6%). In area of specialty, participants in community health (22.9%), internal medicine (22.1%) and paediatrics (20.0%) were more. In knowledge about medical ethics, most obtained it from undergraduate medical school (91.4%) while in knowledge of the supervising body of all medical ethics issues, those with correct knowledge were slightly above average (58.6%).

Table 2: Assessment of Knowledge of the Principles of Public Health Ethics

	Categories	Frequency	Percent
Autonomy	Yes	73	52.1
	No	67	47.9
Beneficence	Yes	89	63.6
	No	51	36.4
Non maleficence	Yes	89	63.6
	No	51	36.4
*Justice	Yes	74	52.9
	No	65	46.4
Overall knowledge	Good (overall knowledge score > average)	58	41.4
	Poor (overall knowledge score ≤ average)	82	58.6

Average of (expected) overall knowledge score = 2

Table 2 displays the assessment of doctors' knowledge of public health ethics. The proportion of doctors that had knowledge of autonomy (52.1%) and justice (52.9%) as public health ethics was about average. The proportion that had knowledge of beneficence (63.6%) and non-maleficence (63.6%) was above average. On the overall, 41.4% of the doctors had knowledge of public health ethics above average and 58.6% had knowledge of public health ethics below or less than average.

Table 3: Variations in the Knowledge of Autonomy as a Public Health Ethics n = 140

		Knowledge of Autonomy		Total	Chi-Square	df	p-value
		Yes	No				
Age	25-34 years	37(53.6)	32(46.4)	69(100.0)	9.091	2	.011
	35-44 years	22(40.7)	32(59.3)	54(100.0)			
	45+ years	14(82.4)	3(17.6)	17(100.0)			
	Total	73(52.1)	67(47.9)	140(100.0)			
Gender	Male	49(57.6)	36(42.4)	85(100.0)	2.627	1	.105
	Female	24(43.6)	31(56.4)	55(100.0)			
	Total	73(52.1)	67(47.9)	140(100.0)			
Present Rank	House officer	31(55.4)	25(44.6)	56(100.0)	14.341	4	.006
	Medical officer	9(42.9)	12(57.1)	21(100.0)			
	Registrar	14(35.0)	26(65.0)	40(100.0)			
	Senior registrar	12(80.0)	3(20.0)	15(100.0)			
	Consultant	7(87.5)	1(12.5)	8(100.0)			
	Total	73(52.1)	67(47.9)	140(100.0)			
Area of specialty	Community health	24(75.0)	8(25.0)	32(100.0)	12.803	4	.012
	Surgery	11(47.8)	12(52.2)	23(100.0)			
	Internal medicine	18(58.1)	13(41.9)	31(100.0)			
	Paediatrics	9(32.1)	19(67.9)	28(100.0)			
	Obstetrics & Gynaecology	11(42.3)	15(57.7)	26(100.0)			
	Total	73(52.1)	67(47.9)	140(100.0)			
Knowledge source	Undergraduate Medical School	69(53.9)	59(46.1)	128(100.0)	1.861	1	.173
	Internet and Medical Journals	4(33.3)	8(66.7)	12(100.0)			
	Total	73(52.1)	67(47.9)	140(100.0)			
Knowledge of supervising body	Correct	43(52.4)	39(47.6)	82(100.0)	.000	1	.982
	Incorrect	30(52.6)	27(47.4)	57(100.0)			
	Total	73(52.5)	66(47.5)	139(100.0)			

Table 3 displays the doctors' knowledge of autonomy as a principle of public health ethics. There

was no significant difference between groups in gender ($p = .105$), knowledge source ($p = .173$) and knowledge of supervising body ($p = .982$). This implies that the knowledge of autonomy was associated equally both to male (57.6%) and female (43.6%) doctors; both to doctors whose knowledge source were from the undergraduate medical school (53.9%) and those whose knowledge source were from the internet and medical journal (33.3%); and both to doctors who had correct knowledge of the supervising body of all medical ethics (52.4%) and those who had incorrect knowledge (52.6%).

In age ($p = .011$), present rank ($p = .006$) and area of specialty ($p = .012$), there were significant differences between groups. In age, knowledge of autonomy was associated more to doctors aged 45 years and above (82.4%) than those aged 25-34 years (53.6%) and those aged 35-44 years (40.7%). In present rank, knowledge was associated more to consultants (87.5%) and senior registrars (80.0%) than house officers (55.4%), medical officers (42.9%) and registrars (35.0%). In area of specialty, the knowledge was associated more to community health doctors (75.0%) than the doctors of other specialties- internal medical doctors (58.1%), surgeons (47.8%), obstetrician and gynaecologists (42.3%) and paediatricians (32.1%).

Table 4: Variations in the Knowledge of Beneficence as a Public Health Ethics n = 140

		Knowledge of Beneficence		Total	Chi Square	df	p-value
		Yes	No				
Age	25-34 years	50(72.5)	19(27.5)	69(100.0)	11.904	2	.003
	35-44 years	25(46.3)	29(53.7)	54(100.0)			
	45+ years	14(82.4)	3(17.6)	17(100.0)			
	Total	89(63.6)	51(36.4)	140(100.0)			
Gender	Male	56(65.9)	29(34.1)	85(100.0)	.499	1	.480
	Female	33(60.0)	22(40.0)	55(100.0)			
	Total	89(63.6)	51(36.4)	140(100.0)			
Present rank	House officer	47(83.9)	9(16.1)	56(100.0)	40.287	4	< .001
	Medical officer	4(19.0)	17(81.0)	21(100.0)			
	Registrar	18(45.0)	22(55.0)	40(100.0)			
	Senior registrar	12(80.0)	3(20.0)	15(100.0)			
	Consultant	8(100.0)	0(0.0)	8(100.0)			
	Total	89(63.6)	51(36.4)	140(100.0)			
Area of specialty	Community health	29(90.6)	3(9.4)	32(100.0)	17.067	4	.002
	Surgery	16(69.6)	7(30.4)	23(100.0)			
	Internal medicine	17(54.8)	14(45.2)	31(100.0)			
	Paediatrics	12(42.9)	16(57.1)	28(100.0)			
	Obstetrics & Gynaecology	15(57.7)	11(42.3)	26(100.0)			
	Total	89(63.6)	51(36.4)	140(100.0)			

*Knowledge source	Undergraduate Medical School	84(65.6)	44(34.4)	128(100.0)	-	-	.122
	Internet and Medical Journals	5(41.7)	7(58.3)	12(100.0)			
	Total	89(63.6)	51(36.4)	140(100.0)			
Knowledge of supervising body	Correct	53(64.6)	29(35.4)	82(100.0)	.151	1	.697
	Wrong	35(61.4)	22(38.6)	57(100.0)			
	Total	88(63.3)	51(36.7)	139(100.0)			

Table 4 displays the doctors' knowledge of beneficence as a principle of public health ethics. There was no significant knowledge difference in gender ($p = .480$), knowledge source ($p = .122$) and knowledge of supervising body ($p = .697$). This implies that knowledge of beneficence was the same both for male (65.9%) and female (60.0%) doctors; both for doctors whose knowledge source was undergraduate medical school (65.6%) and those whose knowledge source was internet and medical journals (41.7%); and both for doctors who had correct knowledge of the supervising body of all medical ethical issues (64.6%) and those who had incorrect knowledge (61.4%). However, significant difference in knowledge existed in age ($p = .003$), present rank ($p < .001$) and area of specialty ($p = .002$). In age, knowledge of beneficence was associated more to doctors aged 45 years and above (82.4%) and those aged 25-34 years (72.5%) than those aged 35-44 years (46.3%). In present rank, knowledge was associated more to consultants (100.0%), house officers (83.9%) and senior registrars (80.0%) than the registrars (45.0%) and medical officers (19.0%). In area of specialty, knowledge was associated more to community health doctors (90.6%) than the doctors of other specialty- surgeons (69.6%), obstetricians and gynaecologists (57.7%), internal medicine doctors (54.8%) and paediatricians (42.9%).

Table 5: Variations in the Knowledge of Non Maleficence as a Public Health Ethics n = 140

		Knowledge of Non Maleficence		Total	Chi Square	df	p-value
		Yes	No				
Age	25-34 years	38(55.1)	31(44.9)	69(100.0)	9.038	2	.011
	35-44 years	35(64.8)	19(35.2)	54(100.0)			
	45+ years	16(94.1)	1(5.9)	17(100.0)			
	Total	89(63.6)	51(36.4)	140(100.0)			
Gender	Male	60(70.6)	25(29.4)	85(100.0)	4.600	1	.032
	Female	29(52.7)	26(47.3)	55(100.0)			
	Total	89(63.6)	51(36.4)	140(100.0)			
Present rank	House officer	29(51.8)	27(48.2)	56(100.0)	13.725	4	.008
	Medical officer	13(61.9)	8(38.1)	21(100.0)			
	Registrar	25(62.5)	15(37.5)	40(100.0)			
	Senior registrar	14(93.3)	1(6.7)	15(100.0)			
	Consultant	8(100.0)	0(0.0)	8(100.0)			

	Total	89(63.6)	51(36.4)	140(100.0)			
Area of specialty	Community health	14(43.8)	18(56.2)	32(100.0)	9.824	4	.044
	Surgery	16(69.6)	7(30.4)	23(100.0)			
	Internal medicine	25(80.6)	6(19.4)	31(100.0)			
	Paediatrics	17(60.7)	11(39.3)	28(100.0)			
	Obstetrics & Gynaecology	17(65.4)	9(34.6)	26(100.0)			
	Total	89(63.6)	51(36.4)	140(100.0)			
			Yes	No			
*Knowledge source	Undergraduate Medical School	79(61.7)	49(38.3)	128(100.0)	-	-	.211
	Internet and Medical Journals	10(83.3)	2(16.7)	12(100.0)			
	Total	89(63.6)	51(36.4)	140(100.0)			
Knowledge of supervising body	Correct	56(68.3)	26(31.7)	82(100.0)	1.578	1	.209
	Incorrect	33(57.9)	24(42.1)	57(100.0)			
	Total	89(64.0)	50(36.0)	139(100.0)			

Table 5 displays the doctors' knowledge of non-maleficence as a principle of public health ethics. In knowledge source ($p = .211$) and knowledge of supervising body ($p = .209$), there was no significant knowledge difference among groups. This implies that knowledge of non-maleficence was the same both for doctors whose knowledge source was undergraduate medical school (61.7%) and those whose knowledge source was internet and medical journals (83.3%); also both for doctors who had correct knowledge of the supervising body of all medical ethical issues (68.3%) and those who had incorrect knowledge (57.9%).

In age ($p = .011$), gender ($p = .032$), present rank ($p = .008$) and area of specialty ($p = .044$), there was, however, a significant knowledge difference of non-maleficence between groups. In age, the knowledge was associated more to doctors aged 45 years and above (94.1%) than those aged 35-44 years (64.8%) and those aged 25-34 years (55.1%). In gender, it was associated more to male doctors (70.6%) than female doctors (52.7%). In present rank, there was a consistent increase in knowledge with increase in rank- consultants (100.0%), senior registrars (93.3%), registrars (62.5%), medical officers (61.9%) and house officers (55.1%); hence, knowledge was associated more to those of higher ranks. In area of specialty, it was associated more to internal medical doctors (80.6%) than the doctors of other specialties- surgeons (69.6%), obstetricians and gynaecologists (65.4%), paediatricians (60.7%) and community health doctors (43.8%).

Table 6: Variations in the Knowledge of Justice as a Public Health Ethics n = 140

		Knowledge of Justice		Total	Chi Square	df	p-value
		Yes	No				
Age	25-34 years	32(46.4)	37(53.6)	69(100.0)	6.353	2	.042

	35-44 years	29(53.7)	25(46.3)	54(100.0)			
	45+ years	13(81.2)	3(18.8)	16(100.0)			
	Total	74(53.2)	65(46.8)	139(100.0)			
Gender	Male	40(47.6)	44(52.4)	84(100.0)	2.692	1	.101
	Female	34(61.8)	21(38.2)	55(100.0)			
	Total	74(53.2)	65(46.8)	139(100.0)			
Present rank	House officer	29(51.8)	27(48.2)	56(100.0)	12.140	4	.016
	Medical officer	7(33.3)	14(66.7)	21(100.0)			
	Registrar	20(50.0)	20(50.0)	40(100.0)			
	Senior registrar	11(73.3)	4(26.7)	15(100.0)			
	Consultant	7(100.0)	0(0.0)	7(100.0)			
	Total	74(53.2)	65(46.8)	139(100.0)			
Area of specialty	Community health	22(68.8)	10(31.2)	32(100.0)	7.537	4	.110
	Surgery	11(47.8)	12(52.2)	23(100.0)			
	Internal medicine	11(35.5)	20(64.5)	31(100.0)			
	Paediatrics	16(57.1)	12(42.9)	28(100.0)			
	Obstetrics & Gynaecology	14(56.0)	11(44.0)	25(100.0)			
	Total	74(53.2)	65(46.8)	139(100.0)			
Knowledge source	Undergraduate Medical School	68(53.5)	59(46.5)	127(100.0)	.055	1	.814
	Internet and Medical Journals	6(50.0)	6(50.0)	12(100.0)			
	Total	74(53.2)	65(46.8)	139(100.0)			
Knowledge of supervising body	Correct	41(50.6)	40(49.4)	81(100.0)	.410	1	.522
	Incorrect	32(56.1)	25(43.9)	57(100.0)			
	Total	73(52.9)	65(47.1)	138(100.0)			

Table 6 displays the doctors' knowledge of justice as a principle of public health ethics. In gender ($p = .101$), area of specialty ($p = .110$), knowledge source ($p = .814$) and knowledge of supervising body ($p = .522$), there was no significant knowledge difference between groups. This implies that there was equal proportion in the knowledge of justice for male (47.6%) and female (61.8%) doctors; for community health doctors (68.8%), surgeons (47.8%), internal medicine doctors (35.5%), paediatricians (57.1%) and obstetricians and gynaecologists (56.0%); also for doctors whose knowledge source was undergraduate medical school (53.5%) and those whose knowledge source was internet and medical journals (50.0%); and also for doctors who had correct knowledge of the supervising body of all medical ethical issues (50.6%) and doctors who had incorrect knowledge (56.1%).

However, there was significant knowledge difference between groups in age ($p = .042$) and present rank ($p = .016$). In age, the knowledge of justice was associated more to doctors aged 45 years and above (81.2%) than those aged 35-44 years (53.7%) and those aged 25-34 years (46.4%). In present rank, it was associated more to consultants (100.0%) and then to senior registrars (73.3%) than to house officers (51.8%), registrars (50.0%) and medical officers (33.3%).

Table 7: Variations in the Overall Knowledge (Score) of Public Health Ethics n = 140

	Categories	n	M±SD	Mean Rank	U test	H test	df	p-value
Age	25-34 years ^a	69	2.28±0.62	69.04	-	26.311	3	< .001
	35-44 years ^a	54	2.06±1.00	59.06				
	45-54 years ^b	10	3.00±0.82	97.90				
	55+ years ^b	6	4.00±0.00	133.00				
Gender	Male	84	2.40±0.92	73.82	1989.0	-	-	.144
	Female	55	2.18±0.84	64.16				
Present rank	House officer ^b	56	2.43±0.50	75.64	-	54.254	4	< .001
	Medical officer ^a	21	1.57±0.60	37.98				
	Registrar ^a	40	1.93±0.89	54.46				
	Senior registrar ^c	15	3.27±0.80	107.70				
	Consultant ^c	7	3.86±0.38	128.93				
Area of specialty	Community health ^b	32	2.78±0.61	91.39	-	18.469	4	.001
	Surgery ^{ab}	23	2.35±1.19	72.43				
	Internal medicine ^{ab}	31	2.29±0.86	70.21				
	Paediatrics ^a	28	1.93±0.72	50.96				
	Obstetrics & Gynaecology ^a	25	2.16±0.90	61.44				
Knowledge source	Undergraduate medical school	127	2.34±0.86	70.99	636.5	-	-	.319
	Internet and medical journals	12	2.08±1.24	59.54				
Knowledge of supervising body	Correct	81	2.35±0.87	70.48	2229.0	-	-	.716
	Incorrect	57	2.28±0.94	68.11				

U test is the Mann-Whitney test; H test is the Kruskal-Wallis test; total frequency < sample size implies some data were missing

Table 7 displays the variations in the overall knowledge of principles of public health ethics. There was no significant knowledge difference among groups in gender ($p = .144$), knowledge source ($p = .319$) and knowledge of supervising body ($p = .716$). This implies that there was the same level

of knowledge of public health ethics for both male (2.40±0.92) and female (2.18±0.84) doctors; for both doctors whose knowledge source was undergraduate medical school (2.34±0.86) and those whose knowledge source was internet and medical journal (2.08±1.24); and also for both doctors who had correct knowledge of the supervising body of all medical ethics (2.35±0.87) and those who had incorrect knowledge (2.28±0.94).

Significant knowledge difference, however, existed between groups in age ($p < .001$), present rank ($p < .001$) and area of specialty ($p = .001$). In age, those aged 55 years and above (4.00±0.00) had highest knowledge followed by those aged 45-54 years (3.00±0.82), while those aged 35-44 years had the least. A Post Hoc test revealed that those aged 25-34 years (2.28±0.62) and those aged 35-44 years (2.06±1.00) had the same knowledge level while those aged 45-55 years (3.00±0.82) and those aged 55 years and above (4.00±0.00) likewise had the same knowledge level. Hence, knowledge level of other pair wise comparisons was significant.

In present rank, consultants (3.86±0.38) had the highest knowledge followed by senior registrars (3.27±0.80), while the medical officers had least (1.57±0.60). A Post Hoc Test revealed that medical officers (1.57±0.60) and registrars (1.93±0.89) had the same knowledge level while senior registrars (3.27±0.80) and consultants (3.86±0.38) likewise had the same knowledge level. Hence, knowledge level of other pairwise comparisons was significant.

In area of specialty, community health doctors (2.78±0.61) had highest knowledge followed by surgeons (2.35±1.19), while the least was paediatricians (1.93±0.72). A Post Hoc test revealed significant difference existed only between community health doctors (2.78±0.61) and paediatricians (1.93±0.72) and between community health doctors (2.78±0.61) and obstetricians and gynaecologists (2.16±0.90).

Table 8a: Logistic Regression Classification Table, Model Summary and Omnibus Test of Model Coefficients of Knowledge of Public Health Ethics with Predictors as Age, Gender, Area of Specialty, Knowledge Source of Public Health Ethics and Knowledge of Supervising Body of Medical Ethics.

Observed	Classification Table			Model Summary			Omnibus Test of Model Coefficients		
		Predicted Knowledge		-2 Log likelihood	Cox & Snell R ²	Nagelkerke R ²	χ^2	df	p-value
	Poor	Good	% Correct						
Knowledge	Poor	61	20	113.085	.420	.566	75.787	9	< .001
	Good	15	43						
Overall %									

The cut value is .500

Table 8b: Logistic Regression Model Coefficients of Knowledge of Public Health Ethics with Predictors as Age, Gender, Area of Specialty, Knowledge Source of Public Health Ethics and Knowledge of Supervising Body of Medical Ethics.

	B	S.E.	Wald	df	p-value	Exp(B)	95% C.I.for EXP(B)
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						Lower	Upper
Age		16.319	2	< .001			
25-34 years	-6.722	1.680	16.007	1	< .001	.0012	< .001
35-44 years	-6.532	1.642	15.827	1	< .001	.0015	< .001
Gender	.541	.566	.913	1	.339	1.717	.566
Area of specialty			19.622	4	.001		
Surgery	-1.023	.662	2.384	1	.123	.360	.098
Internal medicine	-1.343	.610	4.849	1	.028	.261	.079
Paediatrics	-7.788	1.981	15.449	1	< .001	.00041	< .001
Obstetrics & Gynaecology	-4.291	1.167	13.513	1	< .001	.014	.001
Knowledge source	2.443	1.298	3.540	1	.060	11.502	.903
Knowledge of Supervising body	1.284	.525	5.977	1	.014	3.611	1.290
Constant	4.389	1.621	7.327	1	.007	80.529	

Predictors: Age group, Gender, Area of specialty, Knowledge source of medical ethics; knowledge of supervising body.

Reference category: Age (45+ years), Gender (Female), Specialty (Community medicine), Knowledge source of medical ethics (internet and journals); Knowledge of supervising body of all medical ethical issues (Correct)

Tables 8a & 8 b display a logistic regression of age, gender, area of specialty, knowledge source (of public health ethics) and knowledge of the supervising body (of all medical ethical issues) on knowledge of public health ethics. The logistic regression model (logit (having good knowledge of public health ethics) = 4.389 – 6.722*(25-34 years) – 6.532*(35-44 years) + 0.541*gender – 1.023*surgery – 1.343*internal medicine – 7.788*paediatrics – 4.291*obstetrics&gynaecology + 2.443*knowledge source + 1.284*knowledge of supervising body) explained 56.6% (Nagelkerke R²) of the variation in doctors' knowledge of public health ethics (that is, whether good or poor). It also correctly predicted the knowledge status of 74.8% persons. The omnibus test of model coefficients using the Chi-Square revealed that the model coefficients were significant, $\chi^2(9) = 75.787$, $p < .001$. The Wald statistic further indicated that the coefficients of age ($p < .001$), area of specialty ($p = .001$) and knowledge of supervising body ($p = .014$) were significant. This implies that holding other predictors constant, doctors aged 25-34 years and those aged 35-44 years had odds 0.0012 times and 0.0015 times respectively the odds of those aged 45 years and above. Hence, those aged 45 years and above had odds 833.3 times and 666.7 times the odds of those aged 25-34 years and 35-44 years respectively in being classified as doctors with good knowledge of public health ethics.

In area of specialty, obstetricians and gynaecologists had odds .014 times the odds of community health doctors in being classified as a doctor with good public health ethics knowledge. Likewise, internal medicine doctors had odds .261 times while paediatricians had odds .00041 times the odds of community health doctors. In other words, community health doctors had odds 71.4 times, 3.8 times and 2439.0 times the odds of obstetricians and gynaecologists, internal medicine doctors and

paediatricians respectively in being classified as a doctor with good public health ethics knowledge. The odds of community health doctors to surgeons were the same ($p = 123$). In knowledge of supervising body, those with incorrect knowledge had odds 3.6 times the odds of those with correct knowledge of the supervising body. In gender ($p = .339$) and knowledge source of medical ethics ($p = .060$), the Wald statistic revealed no significant difference. This implies that holding other variables constant, the male and female doctors had the same odds, and likewise those that obtained the knowledge from undergraduate medical school and those that obtained it from the internet and medical journal.

Table 9a: Logistic Regression Classification Table, Model Summary and Omnibus Test of Model Coefficients of Knowledge of Public Health Ethics with Predictors as Gender, Rank, Area of Specialty, Knowledge Source of Public Health Ethics and Knowledge of Supervising Body of Medical Ethics.

Observed	Classification Table				Model Summary			Omnibus Test of Model Coefficients		
		Predicted		% Correct	-2 Log likelihood	Cox & Snell R ²	Nagelkerke R ²	χ^2	df	p-value
		Poor	Good							
Knowledge	Poor	68	13	84.0	92.805	.499	.672	96.067	9	< .001
	Good	16	42	72.4						
Overall %				79.1						

The cut value is .500

Table 9b: Logistic Regression Model Coefficients of Knowledge of Public Health Ethics with Predictors as Gender, Rank, Area of Specialty, Knowledge Source of Public Health Ethics and Knowledge of Supervising Body of Medical Ethics.

	B	S.E.	Wald	df	p-value	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Gender	.235	.617	.145	1	.703	1.265	.378	4.237
Rank			24.514	2	< .001			
House officer	-5.895	1.595	13.658	1	< .001	.003	.00012	.063
Medical officer/ Registrar	-7.935	1.703	21.717	1	< .001	.00036	.000013	.010
Area of specialty			20.720	4	< .001			
Surgery	-1.264	.781	2.622	1	.105	.282	.061	1.305
Internal medicine	-1.525	.682	4.997	1	.025	.218	.057	.829
Paediatrics	-8.187	1.975	17.184	1	< .001	.00028	.0000058	.013
Obstetrics & Gynaecology	-4.468	1.226	13.273	1	< .001	.011	.001	.127
Knowledge source	1.961	1.422	1.902	1	.168	7.104	.438	115.209
Knowledge of Supervising body	2.199	.641	11.761	1	.001	9.012	2.565	31.660
Constant	4.919	1.713	8.245	1	.004	136.880		

Predictors: Gender, Rank, Area of specialty, Knowledge source of medical ethics; knowledge of supervising body.

Reference category: Gender (Female), Rank (Senior Registrar/Consultant), Specialty (Community medicine), Knowledge source of medical ethics (internet and journals); Knowledge of supervising body of all medical ethical issues (Correct)

Tables 9a & 9b display a logistic regression of gender, rank, area of specialty, knowledge source (of public health ethics) and knowledge of the supervising body (of all medical ethical issues) on knowledge of public health ethics. The logistic regression model logit (having good knowledge of public health ethics) = $4.919 + 0.235 * \text{gender} - 5.895 * \text{house officer} - 7.935 * \text{medical officer/registrar} - 1.264 * \text{surgery} - 1.525 * \text{internal medicine} - 8.187 * \text{paediatrics} - 4.468 * \text{obstetrics\&gynaecology} + 1.961 * \text{knowledge source} + 2.199 * \text{knowledge of supervising body}$ explained 67.2% (Nagelkerke R^2) of the variation in doctors' knowledge of public health ethics (that is, whether good or poor). It also correctly predicted the knowledge status of 79.1% persons. The omnibus test of model coefficients using the Chi-Square revealed that the model coefficients were significant, $\chi^2(9) = 96.067, p < .001$.

A Wald statistic further indicated that the coefficients of rank ($p < .001$), area of specialty ($p = .001$) and knowledge of supervising body ($p = .014$) were significant. This implies that holding other predictors constant, house officers and medical officers/registrars had odds 0.003 times and 0.00036 times respectively the odds of senior registrars/consultants. Hence, the senior registrars/consultants had odds 333.3 times and 2777.7 times the odds of the house officers and medical officers/registrars respectively in being classified as doctors with good knowledge of public health ethics.

In area of specialty, obstetricians and gynaecologists had odds .011 times the odds of community health doctors in being classified as a doctor with good public health ethics knowledge. Likewise, internal medicine doctors had odds .218 times while paediatricians had odds .00028 times the odds of community health doctors. In other words, community health doctors had odds 90.9 times, 4.6 times and 3571.4 times the odds of obstetricians and gynaecologists, internal medicine doctors and paediatricians respectively in being classified as a doctor with good public health ethics knowledge. The odds of community health doctors to surgeons were the same ($p = .105$).

In knowledge of supervising body, those with incorrect knowledge had odds 9.0 times the odds of those with correct knowledge of the supervising body. In gender ($p = .703$) and knowledge source of medical ethics ($p = .168$), the Wald statistic revealed no significant difference. This implies that holding other variables constant, the male and female doctors had the same odds, and likewise those that obtained the knowledge from undergraduate medical school and those that obtained it from the internet and medical journal.

Discussions

As a way of summary, greater part of the participants were house officers (40.0%) followed by junior registrars (28.6%). In area of specialty, participants in community health (22.9%), internal medicine (22.1%) and paediatrics (20.0%) were more. In knowledge about public health ethics, most obtained it from undergraduate medical school (91.4%) and those with correct knowledge of the supervising body of all medical ethics issues, were slightly above average (58.6%). The proportion of doctors that had knowledge of autonomy (52.1%) and justice (52.9%) as public health ethics was about average, while the proportion that had knowledge of beneficence (63.6%) and non-maleficence (63.6%) was above average. On the overall, 41.4% of the doctors had

knowledge of public health ethics above average. There was no significant difference among groups in doctors' knowledge of autonomy as a principle of public health ethics as in gender ($p = .105$), knowledge source ($p = .173$) and knowledge of supervising body ($p = .982$). In age ($p = .011$), present rank ($p = .006$) and area of specialty ($p = .012$), there were significant differences among groups. In age, knowledge of autonomy was associated more to doctors aged 45 years and above (82.4%). In present rank, knowledge was associated more to consultants (87.5%) and senior registrars (80.0%). In area of specialty, the knowledge was associated more to community health doctors (75.0%) than the doctors of other specialties. There was no significant knowledge difference in gender ($p = .480$), knowledge source ($p = .122$) and knowledge of supervising body ($p = .697$) when it comes to doctors' knowledge of beneficence as a principle of public health ethics. However, significant difference in knowledge existed in age ($p = .003$), present rank ($p < .001$) and area of specialty ($p = .002$). In age, knowledge of beneficence was associated more to doctors aged 45 years and above (82.4%). In present rank, knowledge was associated more to consultants (100.0%), house officers (83.9%) and senior registrars (80.0%). In area of specialty, knowledge was associated more to community health doctors (90.6%) than the doctors of other specialty. In knowledge source ($p = .211$) and knowledge of supervising body ($p = .209$), there was no significant knowledge difference of non-maleficence among groups. In age ($p = .011$), gender ($p = .032$), present rank ($p = .008$) and area of specialty ($p = .044$), there was, however, a significant knowledge difference of non-maleficence between groups. In age, the knowledge was associated more to doctors aged 45 years and above (94.1%). In gender, it was associated more to male doctors (70.6%) than female doctors (52.7%). In area of specialty, it was associated more to internal medical doctors (80.6%) than the doctors of other specialties. In doctors' knowledge of justice as a principle of public health ethics there was no significant difference among groups as shown in gender ($p = .101$), area of specialty ($p = .110$), knowledge source ($p = .814$) and knowledge of supervising body. However, there was significant knowledge difference among groups in age ($p = .042$) and present rank ($p = .016$). In age, the knowledge of justice was associated more to doctors aged 45 years and above (81.2%) than those aged 35-44 years (53.7%) In present rank, it was associated more to consultants (100.0%) and then to senior registrars (73.3%). In the overall knowledge of principles of public health ethics, there was no significant knowledge difference among groups in gender ($p = .144$), knowledge source ($p = .319$) and knowledge of supervising body ($p = .716$). Significant knowledge difference, however, existed between groups in age ($p < .001$), present rank ($p < .001$) and area of specialty ($p = .001$). In age, those aged 55 years and above (4.00 ± 0.00) had highest knowledge followed by those aged 45-54 years (3.00 ± 0.82), while those aged 35-44 years had least. In present rank, consultants (3.86 ± 0.38) had the highest knowledge followed by senior registrars (3.27 ± 0.80). In area of specialty, community health doctors (2.78 ± 0.61) had highest knowledge followed by surgeons (2.35 ± 1.19). A Post Hoc test revealed significant difference existed only between community health doctors (2.78 ± 0.61) and paediatricians (1.93 ± 0.72) and between community health doctors (2.78 ± 0.61) and obstetricians and gynaecologists (2.16 ± 0.90). A logistic regression of age, gender, area of specialty, knowledge source (of public health ethics) and knowledge of the supervising body (of all medical ethical issues) on knowledge of public health ethics revealed that the omnibus test of model coefficients using the Chi-Square revealed that the model coefficients were significant, $\chi^2(9) = 75.787$, $p < .001$. The Wald statistic further indicated that the coefficients of age ($p < .001$), area of specialty ($p = .001$) and knowledge of supervising body ($p = .014$) were significant. This

implies that holding other predictors constant, those aged 45 years and above had odds 833.3 times and 666.7 times the odds of those aged 25-34 years and 35-44 years respectively in being classified as doctor with good knowledge of public health ethics. Also the same result shows that community health doctors had odds 71.4 times, 3.8 times and 2439.0 times the odds of obstetricians and gynaecologists, internal medicine doctors and paediatricians respectively in being classified as a doctor with good public health ethics knowledge. In knowledge of supervising body, those with incorrect knowledge had odds 3.6 times the odds of those with correct knowledge of the supervising body. A logistic regression of gender, rank, area of specialty, knowledge source (of public health ethics) and knowledge of the supervising body (of all medical ethical issues) on knowledge of public health ethics, correctly predicted the knowledge status of 79.1% persons. The omnibus test of model coefficients using the Chi-Square revealed that the model coefficients were significant, $\chi^2(9) = 96.067$, $p < .001$. A Wald statistic further indicated that the coefficients of rank ($p < .001$), area of specialty ($p = .001$) and knowledge of supervising body ($p = .014$) were significant. This implies that holding other predictors constant, the senior registrars/consultants had odds 333.3 times and 2777.7 times the odds of the house officers and medical officers/registrar respectively in being classified as doctor with good knowledge of public health ethics. In area of specialty, community health doctors had odds 90.9 times, 4.6 times and 3571.4 times the odds of obstetricians and gynaecologists, internal medicine doctors and paediatricians respectively in being classified as a doctor with good public health ethics knowledge. In knowledge of supervising body, those with incorrect knowledge had odds 9.0 times the odds of those with correct knowledge of the supervising body.

In discussion, present rank, knowledge of public health ethics in our study was associated more to consultants (87.5%) and senior registrars (80.0%). In area of specialty, the knowledge was associated more to community health doctors (75.0%) than the doctors of other specialties. This is very much expected as consultants and registrars would have gained more experience and knowledge on the job due to years of service, better qualifications and probably knowledge from seminars and hands on the job experience. As expected also, the knowledge was associated more to community health doctors who are foremost in community health. This finding is partly supported by (Fadare et al, 2012) where it was found that senior registrars and consultants had appreciable difference in the knowledge of public health ethics compared to the junior doctors especially for the core ethical principles, i.e., beneficence, non-maleficence, and justice. However, our finding was rather not supported by (Sulmasy et al. 1995; Walrond et al, 2006 and Quratul et al, 2013) where the studies either found no differences or low scores in the knowledge base of the senior and junior colleagues relating to core public health ethics.

In our study also, knowledge about public health ethics was mostly obtained from undergraduate medical school (91.4%) and those with correct knowledge of the supervising body of all medical ethical issues, were slightly above average (58.6%). The proportion of doctors that had knowledge of autonomy (52.1%) and justice (52.9%) as public health ethics was about average, while the proportion that had knowledge of beneficence (63.6%) and non- maleficence (63.6%) was above average. This is rather encouraging as medical schools are beginning to teach public health ethics unlike before. This finding is equally supported by (Walrond et al, 2006) where it was found that the doctors received their knowledge of public health ethics from multiple sources and particularly from lectures/seminars, and found case conferences the most helpful. Only a few students in that

study felt that text books had been helpful.

On the overall, 41.4% of the doctors in our study had knowledge of public health ethics above average. There was no significant difference among groups in doctors' knowledge of autonomy as a principle of public health ethics as in gender ($p = .105$), knowledge source ($p = .173$) and knowledge of supervising body ($p = .982$). The above average knowledge of public health ethics by doctors in our study which stands at 41.4% is rather low but encouraging compared to (Quratul et al, 2013) where there was a general unawareness regarding medical law and ethics among all levels of respondent doctors. Physicians had poor knowledge (Quratul et al, 2013) regarding autonomy and gave mixed responses about patient's rights when the questions were differently phrased.

Our study found that in age ($p = .011$), present rank ($p = .006$) and area of specialty ($p = .012$), there were significant differences among groups in knowledge of public health ethics. In age, knowledge of autonomy was associated more to doctors aged 45 years and above (82.4%). In present rank, knowledge was associated more to consultants (87.5%) and senior registrars (80.0%). In area of specialty, the knowledge was associated more to community health doctors (75.0%) than the doctors of other specialties. The results above could be seen as normal and expected as improvement in knowledge of public health ethics was associated more to older doctors and consultants. This result is also supported by (Fadare et al, 2012) where it was noted that there was an appreciable difference in the knowledge base of junior doctors (house officers, medical officers and registrars) when compared to the more senior ones (senior registrars and consultants) with statistical significance especially for the core ethical principles, i.e., beneficence, non-maleficence, and justice in favour of the latter. This result is also supported by (Sulmasy et al, 1995) where it was found that though the knowledge scores for public health ethics were low for both the faculty (higher ranked) and the house officers (lower ranked) in a medical college, however, the faculty was significantly more confident than the house officers regarding ability to address ethical issues. Significant knowledge difference, however, existed between groups in age ($p < .001$), present rank ($p < .001$) and area of specialty ($p = .001$). In age, those aged 55 years and above (4.00 ± 0.00) had highest knowledge followed by those aged 45-54 years (3.00 ± 0.82), while those aged 35-44 years had the least. In present rank, consultants (3.86 ± 0.38) had the highest knowledge followed by senior registrars (3.27 ± 0.80). In area of specialty, community health doctors (2.78 ± 0.61) had highest knowledge followed by surgeons (2.35 ± 1.19). This result again represents normalcy as the older doctors, consultants and community health doctors had highest knowledge of public health ethics. The older doctors and the consultants are likely the same persons as consultancy which is normally achieved with age and experience and as expected community health physicians are foremost in the knowledge of public health ethics being their field of specialty.

In conclusion, a logistic regression of age, gender, area of specialty, knowledge source (of public health ethics) and knowledge of the supervising body (of all medical ethical issues) on knowledge of public health ethics revealed that the omnibus test of model coefficients using the Chi-Square revealed that the model coefficients were significant, $\chi^2(9) = 75.787$, $p < .001$. The Wald statistic further indicated that the coefficients of age ($p < .001$), area of specialty ($p = .001$) and knowledge of supervising body ($p = .014$) were also significant confirming all our earlier results.

Overall, only 41.4% of the doctors had knowledge of public health ethics above average. Improving on that number will be encouraging. Having also learned that most participants obtained

knowledge of public health ethics from undergraduate medical school (91.4%) is very encouraging. Increasing the knowledge base of the doctors could mean extending the teaching of public health ethics to the post graduate schools. Attendance of seminars and workshops dealing with public health ethics could be made part of medical license renewal but especially for younger and nonconsultant and senior registrars. Bridging the knowledge gap between older doctors and younger ones, between consultants and junior ranked doctors and between community health physicians and other specialties should be undertaken through continuing education since all of them face similar circumstances in the field of practice. More so, continuing education in the forms of seminars and workshops will play important parts in bridging the deficiencies in public health ethics knowledge.

Conclusion

Though the knowledge base of the responding medical doctors in public health ethics is 41.4% above average, there still remain needs for improvement. With increasing medical technology that sustains and prolongs life and with patients demanding that doctor put in more to better their conditions and inadvertently perform miracles, medical ethical challenges are bound to increase in the process. Given the conditions as expressed above, there is need for a review of the medical curriculum in Nigeria. In this vein, a review of the undergraduate curriculum in public health ethics would be helpful to cover deficient areas and more so the teaching of public health ethics should be extended to the post graduate level. Post graduate diplomas in public health ethics and bioethics should also be encouraged through medical license renewal.

Strength and limitations of the study

This study has explored in general the knowledge base of medical doctors in a Nigerian tertiary institution concerning public health ethics. It gathers its strength from the fact that this has been a gray area hitherto and informs of the challenges and areas of likely improvements in public health ethics. The limitation of this study is that only one institution was involved in the study. Future studies should improve on this by including more institutions.

Declarations

Ethical approval and consent to participate

Ethical approval for this study was obtained from the university of Nigeria ethics review committee after it was cleared that the study design protected the participants as required by law. Each participant's consent was obtained after thorough explanation of the study and how it poses no danger to him/her. The study was conducted according to HELSIKI ACCORD and local legislations.

Consent for publication

Not applicable

Competing interests

The authors declare no competing interests.

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List of Abbreviations

(WHO) World Health Organisation
(U.S.) Unites States
(UK) United Kingdom

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