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Integration of Traditional and Complementary Medicine into medical school curricula: A survey among medical students in Makerere University, Uganda

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Abstract

Objective: To describe the disposition and sociodemographic characteristics of medical students associated with inclusion of traditional and complementary medicine in medical school curricula in Uganda.

Design: A cross-sectional study conducted during May 2017. A pretested questionnaire was used to collect data. Disposition to include principles of traditional and complementary medicine into medical school curricula was determined as proportion and associated factors determined through multivariate logistic regression analysis.

Participants and setting: Medical students in their 2nd to 5th years at the College of Health Sciences, Makerere University, Uganda. Makerere University is the oldest public university in the east African region.

Results: About 60% (192/325) of participants recommended inclusion of traditional and complementary medicine principles into medical school curricula in Uganda. The disposition to include traditional and complementary medicine into medical school curricula was not associated with sex, age group, nor region of origin of the students. However, compared to the 2nd year students, the 3rd (OR=0.34; 95%CI: 0.17-0.66) and 5th (OR=0.39; 95%CI: 0.16-0.93) year students were significantly less likely to recommend inclusion of traditional and complementary medicine into the medical school curricula. Participants who hold positive attributes and believe in effectiveness of traditional and complementary medicine were statistically significantly more likely to recommend inclusion into the medical school curricula in Uganda.

Conclusions: Inclusion of principles of traditional and complementary medicine into medical school curricula to increase knowledge, inform practice and research, and moderate attitudes of physicians towards traditional medicine practice is acceptable by medical students at

Makerere University. These findings can inform review of medical schools' curricula in Uganda.

Key words: Traditional and complementary medicine, Medical school curricula, Medical students, Makerere University, Uganda.

Strengths and limitations of this study

- To our knowledge, this is the first study to systematically evaluate the disposition of medical students and their sociodemographic factors associated with intention to include principles of traditional and complementary medicine into medical school curricula in Uganda.
- More than 70% (395/558) of registered medical students enthusiastically participated in the study; no eligible participants available at time of study declined participation.
- The study involved students from only one public medical school; so findings may be systematically different from studies conducted in the newer medical schools.
- The cross sectional nature of the study limits attributing the difference in dispositions to include traditional and complementary medicine by year of study to the effect of time in training and interactions in the medical school.

Background

Worldwide, a significant proportion of patients use traditional and complementary medicine (T&CM) in the treatment of various illnesses. For example, it was shown in a systematic review of 26 studies done in 13 countries that 7% – 64% of cancer patients (average use 31%) use T&CM at some point during their illness[1]. In sub Saharan Africa, a recent systematic review showed a high use of T&CM alone or in combination with conventional medicine. Most of the users were likely to be of low socioeconomic status and low educational attainment. The review also showed that most of the users (55.8% - 100%) do not disclose use to healthcare professionals[2]. In Uganda, T&CM practice is common across a range of illnesses including diabetes, hypertension and cancers. People use T&CM for various reasons including beliefs in intrinsic efficacy, long history of use, and perceived barriers to biomedical care[3-6]. It is likely that T&CM use and traditional healing practices will continue side by side with biomedicine for the foreseeable future[7]. In addition, the World Health Organization (WHO) supports the incorporation of T&CM into national health systems and has developed a traditional medicine strategy (2014 – 2023) that stipulates the importance of and how to integrate traditional medicine into the national biomedical health system. The WHO strategies acknowledge that T&CM of proven quality, safety, and efficacy essentially contributes to improving access to care by all people in need[8].

Regardless of whether patients choose to use T&CM in parallel, interchangeably or in combination with biomedicine, physicians ought to uphold the ethical principles of beneficence and safeguard public welfare by among others providing appropriate management based on best available evidence[9]. The duty to prevent harm and protect patients' welfare demands that healthcare professionals (HCPs) have access to information regarding evidence on efficacious and effective T&CM, and know about the harmful effects of T&CM in order to be able to

provide appropriate guidance to their patients and the public regarding their healthcare choices[10]. It is further argued that failure of HCPs to advice patients against potentially harmful T&CM is unethical because such patients could get harmed by using T&CMs[11]. Including aspects of T&CM in medical school curricula increases awareness and knowledge of the future clinicians on T&CM, enables the students to understand better the paradigm from which traditional health practitioners (THP) treat their patients, and potentially fosters cooperation and collaboration between T&CM practitioners and conventional medicine[12 13]. In addition, there is evidence that general knowledge regarding the theories and fundamentals in T&CM practices could help physicians in guiding patients about their health choices[14]. To that extent, physicians ought to know about T&CM so they can guide their patients appropriately and ensure safety of use of T&CM alone or in combinations with conventional medicine. This requires that medical schools include principles of T&CM into their curricula, so the medical students could learn about T&CM principles including why T&CM matters, how to talk about it with patients, how/where to access it, how they work, and potential side effects, without taking on the expectation of becoming expert in its delivery. The medical schools need not appear to be training the medical students to become T&CM practitioners, a notion that could make the T&CM practitioners feel threatened in their trade and object genuine integration of biomedicine with T&CM. However, there are limited data on the proportions of medicinal schools in sub Saharan Africa that teach aspects of T&CM to their medical students. Similarly, there is limited awareness of the disposition of medical students towards the integration of T&CM into medical school curricula in Uganda and most sub Saharan Africa. Therefore, there is need to determine upfront the proportion and characteristics of medical students who endorse the inclusion of T&CM into the curricula of medical schools. The aim of this study was therefore to understand the attitudes and perceptions of medical students at Makerere University College of Health Sciences (MakCHS) regarding the inclusion of principles of

T&CM into medical school curricula. These findings can inform policies on the integration of T&CM and biomedical practices in Uganda so that the medical students and physicians (i) become familiar with the epidemiology of use and best available evidence of T&CM (where to find it, how to interpret it), and (ii) know how to discuss issues of T&CM with patients in an open and non-judgmental way.

Methods

Study design and setting

We conducted a cross sectional survey at the School of Medicine, Makerere University College of Health Science (MakCHS). The School of Medicine was started in 1923. It is the oldest medical school in Uganda and admits about 80 - 100 first year medical students every year. The school has been keen to adopt innovative approaches to training and learning including problem based learning (PBL) and community based education and service (COBES) to improve learning experience and produce doctors with knowledge and skills that are relevant to demands of the societies they serve[15-18].

Study population and period

Participants to this study included all registered Ugandan male and female medical students in the second, third, fourth and fifth years pursuing the degree of bachelor of medicine and bachelor of surgery (MBChB). The MBChB program involves five years of theoretical and practical training before the successful candidates enrol for a supervised internship practice of one year. First year students were excluded from this study on assumption that their views might be very similar to views of the general community, and lack the insight that medical students typically have as product of their training and experiences in the training institution. The curriculum of the students involves rotation and training on the wards during the fourth and fifth years of study. Foreign students (n=36) were excluded because their concepts of T&CM could be influenced by the status of practices in their home countries. Data was collected in May 2017, during the week immediately after the end of year university examinations when students were generally available on campus and awaiting the start of the recess semester.

Sampling and recruitment of participants

The first author and three research assistants (RA) met with the president of the medical students' association (Makerere University Medical Students' Association – MUMSA), and discussed the objectives and procedures for the study. Thereafter, the president and the RAs met with the class representatives of the 2nd, 3rd, 4th and 5th year students, and agreed on the dates and time for interviews for each class. The students were met separately by their year of study in designated lecture theatres following mobilization by the president and the class representatives. The fifth year students were the first to be interviewed because they would soon leave the University for Internship. Subsequently, the fourth, third and second year students were met, each group on different days. The research assistants provided explanations about purpose and objectives of the study to all eligible participants before enrolment. Thereafter, prospective participants were given the study information sheet with detail information on the study including objectives, inclusion criteria, consent procedures and rationale for selection of the specific category of participants. Every registered student present in the meeting who met eligibility criteria was enrolled in the study. Participants were given opportunity to ask questions regarding the study. Individual informed consents were sought from each participant before administration of the questionnaire. No prospective participants declined participation in the study. Participants self-completed the questionnaires and returned them to the RAs through their representatives. Participants who wished to complete their questionnaires from their halls of residents were allowed to return the completed questionnaires the following day and deposit with the MUMSA president. All participants returned their completed questionnaires.

Sample size estimation

Sample size estimation was based on the Kish Leslie formula[19]. The estimated sample size was 383 students. An a priori decision was made to include all eligible students in 2nd to 5th years of study. 395 students were included in the study.

Data collection

The tool for this study was developed based on experiences of the investigators and literature regarding traditional medicine, physicians' knowledge of T&CM, and the inclusion of T&CM into medical school curricula. The tool was piloted with ten medical students from third year; these students were subsequently excluded from participation in the main data collection. The pilot data were reviewed, and the tool was refined before use in the main data collection. The first author (ADM) supervised the research assistants during data collection. The students self-administered the questionnaires after provision of written informed consents. Participants were asked about self-use of T&CM, and their disposition towards including T&CM principles into medical school curricula so medical students could understand the basic tenets of T&CM and know how to talk about them with their patients. Attitudes towards effectiveness, safety and usefulness of T&CM were assessed by asking participants questions about T&CM values and utility. For example, participants were asked about self-use and desire for more knowledge on T&CM, willingness to discuss and reactions to issues on T&CM during medical consultations once they have qualified as doctors, whether or not they consider T&CM safe, and perceived value of integrating T&CM with the mainstream national health system.

Data management and analysis

Data was entered on Epi Data, version 3.1 (Epidata software, Odense, Denmark). A biostatistician randomly selected 10% of the questionnaires, and independently entered them as part of quality check. There were no significant data entry errors found in the dataset. The full dataset was exported into STATA I/C, version 13.1 (StataCorp LP, College Station, TX, USA). Analyses included descriptive statistics and determinations of associations between explanatory demographic variables and outcome variables including disposition to include principles of T&CM into medical school curricula. The secondary outcome measure was attitudes towards incorporating T&CM into mainstream biomedicine. Chi-square tests were used to determine associations between the explanatory variables and outcome variables. Unconditional logistic regression models were used to determine magnitudes of associations between explanatory and outcome variables. Odds ratios have been reported with accompanying two-tail 95% confidence intervals.

Results

Study participants

The distribution of students by year of study were relatively comparable: second year (25.8%; n=98), third year (28.9%; n=110), fourth year (23.9%; n=91) and fifth years (21.3%; n=81). Majority of participants were male (70.5%; n=277) and aged 23 – 26 years (50.5%, n=277) (Table 1).

Table 1: Demographic characteristics by year of study

	Year of study N (%)				
Variable	**2nd**	**3rd**	**4th**	**5th**	**Total**
Age group (Years)	98	110	91	81	380
19 - 22	77 (56.2)	51(37.2)	6 (4.4)	3 (2.2)	137
23 – 26	14 (7.3)	42 (21.9)	68 (35.4)	68 (35.4)	192
≥ 27	7 (13.7)	17 (33.3)	17 (33.3)	10 (19.6)	51
Missing	13	0	1	3	17
Gender	104	109	92	82	393
Male	71 (25.6)	76 (27.4)	70 (25.3)	60 (21.7)	277
Female	37 (31.9)	35 (30.1)	22 (19.0)	22 (19.0)	116
Missing	7	1	0	2	10
Region of origin	111	110	92	84	387
Northern	6 (23.1)	5 (19.2)	9 (34.6)	6 (23.1)	26
North Eastern	2 (16.7)	2 (16.7)	4 (33.3)	4 (33.3)	12
Eastern	16 (21.9)	22 (30.1)	22 (30.1)	13 (17.8)	73
West Nile	4 (28.6)	2 (14.3)	6 (42.9)	2 (14.2)	14
Mid-Western	9 (27.3)	12 (36.4)	7 (21.2)	5 (15.2)	33
South Western	19 (36.5)	19 (36.5)	6 (11.5)	8 (15.4)	52
Central	48 (28.7)	43 (25.8)	35 (21.0)	41 (24.6)	167
Missing	0	4	3	3	10

Missing participants were not included in further analyses.

Inclusion of traditional and complementary medicine into medical school curricula

More than half of participants (59.1%; 192/325) wished that theories and principles of T&CM be included in the medical school curricula in Uganda. On adjusting for sex, age and region of origin, the third (OR=0.34;95%CI:0.17 - 0.66) and fifth (OR=0.39;95%CI:0.16 - 0.93) year medical students were statistically significantly less likely to desire the inclusion of T&CM

into medical school curricula as compared to the second year medical students. There was no statistically significant difference in the disposition to include T&CM into the curricula by gender, age groups and region of origin (Table 2).

Table 2: Demographic characteristics and disposition to include traditional and complementary medicine (T&CM) theories and principles into medical school curricula

	Integrate T&CM into the medical school curricula		**Odds Ratios (OR)**	
Demographic variables N (%)	**Yes, N**	**No, N (%)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)**
Sex, N = 314	**193**	**134**		
Male	138 (58.2)	99 (41.8)	1.00	1.00
Female	55 (61.1)	35 (38.9)	1.13(0.69 - 1.85)	1.07 (0.62 - 1.87)
Age group (Years), N = 322	**187**	**127**		
19 – 22	68 (60.2)	45 (39.8)	1.00	1.00
23 – 26	96 (61.1)	61 (38.9)	1.04 (0.63 - 1.71)	1.55 (0.77 - 3.11)
≥ 27	23 (52.3)	21 (47.7)	0.72 (0.36 - 1.46)	1.07 (0.47 - 2.45)
Years of study, N = 325	**192**	**133**		
2nd	67 (71.3)	27 (28.7)	1.00	1.00
3rd	44 (46.3)	51 (53.7)	**0.35 (0.19 - 0.63)**	**0.34 (0.17 - 0.66)**
4th	45 (63.4)	26 (36.6)	0.70 (0.36 - 1.35)	0.62 (0.26 - 1.43)
5th	36 (55.4)	29 (44.6)	**0.50 (0.26 - 0.97)**	**0.39 (0.16 - 0.93)**
Region of origin of student, N = 325	**189**	**132**		
Northern	15 (62.5)	9 (37.5)	1.00	1.00
North Eastern	5 (45.5)	6 (54.5)	0.48 (0.12 - 1.93)	0.54 (0.12 - 2.37)
Eastern	28 (50.9)	27 (49.1)	0.71(0.28 - 1.85)	0.76 (0.27 - 2.10)
West Nile	6 (75.0)	2 (25.0)	2.00 (0.33 - 11.97)	1.69 (0.25-11.40)
Mid-Western	18 (9.3)	10 (7.3)	1.2 (0.39 - 3.65)	1.33 (0.41-4.28)
South Western	25 (56.8)	19 (43.2)	0.83 (0.31- 2.25)	1.09 (0.37-3.19)
Central	90 (62.5)	54 (37.5)	1.10 (0.46 - 2.63)	1.29 (0.51 - 3.27)
Missing	2 (28.6)	5 (71.4)	0.4 (0.08 - 2.06)	0.35 (0.05 - 2.36)

Adjustment done for demographic factors in the table. Bold face indicates statistically significant findings.

Attitudes and perceived values of traditional and complementary medicines

More than half of participants reported ever using T&CM for various ailments (59.6%; 192/322), while about two thirds (63.9%; 185/291) would want to know more about T&CM. The odds of recommending inclusion of principles of T&CM into the medical school curricula in Uganda was statistically significantly greater among participants who affirmed positive attributes to T&CM compared with participants who did not believe in the effectiveness T&CM. For example, upon adjusting for age, sex, year of study and region of origin, participants who reported self-use of T&CM (OR=2.01;95%CI:1.16 - 3.44), wanted to know more about T&CM (OR=19.68;95%CI:7.58-51.13), willing to discuss T&CM with patients (OR=25.72;95%CI;11.75 - 56.30) and willing to refer patients to T&CM practitioners (OR=12.70;95%CI:5.12-31.46) were statistically significantly more likely to recommend integration of T&CM principles into medical school curricula compared to those who never used T&CM, never wanted to know more about T&CM, not willing to discuss issues of T&CM with their patients, and not in disposition to refer patients to T&CM practitioners once in practice respectively (Table 3). On the other hand, there was consistently lower odds of wishing to include T&CM into medical school curricula by participants who affirmed negative attributes including that "encouraging use of T&CM is detrimental to public health" (OR=0.17;95%CI:0.09 – 0.33) and "there is no estimable benefits of using T&CM" (0OR=0.13;95%CI: 0.07-0.25) as compared to participants who thought T&CM was useful to the population and has definite health benefits respectively (Table 3).

Table 3: Disposition to traditional and complementary medicines (T&CM)

Explanatory Variables N (%)	Integrate T&CM in the medical school curricula		Odds Ratios (OR)	
	Yes, N	No, N	Crude OR (95%CI)	Adjusted OR (95%CI)*
Self-use of T&CM (Ever), N = 322	**192**	**130**		
Yes	142 (63.7)	81 (36.3)	1.72 (1.06 - 2.77)	2.01 (1.16 – 3.44)
No	50 (50.5)	49 (49.5)	1.00	1.00
Wants to know more about T&CM, N = 291	**185**	**106**		
Yes	179 (73.1)	66 (26.9)	18.08 (7.32 – 44.6)	19.68 (7.58 – 51.13)
No	6 (13.0)	40 (87.0)	1.00	1.00
Integrate practice of T&CM into mainstream biomedicine, N = 286	**175**	**111**		
Yes	168 (88.9)	21 (11.1)	102.9 (42.11 –251.2)	179.3 (57.4 – 560.1)
No	7 (7.2)	90 (92.8)	1.00	1.00
Willingness to refer to T&CM practitioners N = 271	**150**	**121**		
Yes	69 (90.8)	7 (9.2)	13.87 (6.06 – 31.75)	12.70 (5.12 – 31.46)
No	81 (41.5)	114 (58.5)	1.00	1.00
Willingness to discuss T&CM with patients N = 293	**176**	**117**		
Yes	166 (76.7)	45 (21.3)	26.56 (12.69 – 55.61)	25.72 (11.75 – 56.3)
No	10 (12.2)	72 (87.8)	1.00	1.00
There are no estimable benefits of T&CM N = 271	**161**	**110**		
Yes	26 (30.6)	59 (69.4)	0.17 (0.09 – 0.29)	0.13 (0.07 – 0.25)
No	135 (72.6)	51 (27.4)	1.00	1.00
Encouraging use of T&CM at biomedical facilities poses threat to public health N = 262	**148**	**109**		
Yes	46 (40.0)	69 (60.0)	0.26 (0.16 – 0.44)	0.17 (0.09 – 0.33)
No	102 (71.8)	40 (28.2)	1.00	1.00

*Adjusted for: age, sex, region of origin of students and year of study at medical school.

Incorporating traditional and complementary practices in the national health system

Two thirds (66.9%; 218/326) of participants endorsed integrating principles and practices of T&CM into the national health system. However, participants in third year were less likely to desire incorporation of T&CM practices into the mainstream national health system (OR=0.40;95%CI:0.20 – 0.80) as compared to the second year students who had not yet had clinical exposure during their training in the medical school. This association was not statistically significant for the fourth and fifth year medical students. Age and gender were not statistically significantly associated with the disposition to integrate T&CM into the mainstream national health system (Table 4).

Table 4: Disposition to integrate traditional and complementary (T&CM) medicine practice into mainstream medicine

Demographic variables	Integrate T&CM into the national health system		Odds Ratios	
	Yes, N	No, N	Crude odds Ratio (OR) (95%CI)	Adjusted Odds Ratio (AOR) ** (95%CI)
Sex				
N = 328	**219**	**109**		
Male	149 (63.9)	84 (36.1)	1.00	1.00
Female	70 (73.7)	25 (26.3)	1.58 (0.93 - 2.68)	1.67 (0.92 - 3.03)
Age group (Years)				
N = 314	**209**	**105**		
19 – 22	74 (64.4)	41 (35.6)	1.00	1.00
23 – 26	105 (67.7)	50 (32.3)	1.16 (0.70 - 1.94)	1.68 (0.82 - 3.44)
≥ 27	30 (68.2)	14 (31.8)	1.19 (0.57 - 2.49)	1.61 (0.68 - 3.84)
Years of study				
N = 326	**218**	**108**		
2nd	71 (75.5)	23 (24.5)	1.00	1.00
3rd	51 (54.8)	42 (45.2)	**0.39 (0.21 - 0.73)**	**0.40 (0.20 - 0.80)**
4th	53 (72.6)	20 (27.4)	0.86 (0.43 - 1.72)	0.77 (0.31 - 1.89)
5th	43 (65.2)	23 (34.8)	0.61 (0.30 - 1.21)	0.45 (0.18 - 1.10)
Region of origin of student	**215**	**107**		

N = 322				
Northern	14 (58.3)	10 (41.7)	1.00	1.00
North Eastern	6 (54.6)	5 (45.4)	0.85 (0.20 - 3.61)	0.95 (0.22 - 4.13)
Eastern	39 (66.1)	20 (33.9)	1.39 (0.53 - 3.69)	1.42 (0.51 - 3.92)
West Nile	10 (83.3)	2 (16.7)	3.57 (0.64 - 19.97)	3.05 (0.50 - 8.40)
Mid-Western	16 (64.0)	9 (36.0)	1.27 (0.40 - 4.02)	1.42 (0.43 - 4.67)
South Western	23 (62.2)	14 (37.8)	1.17 (0.41 - 3.35)	1.34 (0.44 - 4.07)
Central	105 (71.4)	42 (28.6)	1.79 (0.74 - 4.33)	2.05 (0.81 - 5.16)
Missing	2 (28.6)	5 (71.4)	0.29 (0.05 - 1.78)	0.38 (0.06 - 2.61)

**Adjusted for the demographic factors included in the table.

Discussion

The main aims of this study were to quantify the disposition to include principles of T&CM into medical school curricula and to determine factors that are associated with the disposition among preclinical and clinical year students at the oldest medical school in Uganda. In addition, we also sought to determine attitudes of the students towards integration of T&CM into mainstream national health services. We found that two thirds of medical students considered it necessary to include T&CM principles into the medical school curricula in Uganda. More than half of participants also reported self-use of T&CM, wanted to learn more about T&CM as well as wished to have T&CM integrated into the national health system of Uganda. However, up to 60% (161/271) of the students also noted that the issue of T&CM needs to be handled with caution because it is difficult to estimate the benefits and harms that may arise from using T&CM. These findings support the need to conduct similar studies with government regulatory bodies including the Medical and Dental Practitioners Council and ministry of health officials to determine their disposition in order to inform the process of curricula review and the integration of T&CM and biomedicine into one national health system. Our qualitative study that preceded this study revealed some ethical and operational challenges that need to be addressed before and during integration[20]. Drawing from both this study and our earlier qualitative study with medical students, their faculty and the traditional health practitioners, there is a clear need to equip the medical students and healthcare professionals with critical knowledge and approaches to T&CM practice in order to enable them communicate better with their patients who often use T&CM modalities. Empowering healthcare professionals with the tools to talk to patients and find/use evidence-based resources will potentially lead to minimizing delay in health seeking and avoid late detection of illnesses.

Medical students do not need to be trained to practice T&CM, but rather to know about and become aware of the paradigm from which T&CM practitioners do their healing. Biomedical and traditional health practitioners who currently have inadequate knowledge of what each other do could then work side by side in an integrated national health system with clear regulations to guide and control practices. Hitherto, there are two parallel health systems in Uganda: the dominant biomedical national health system and the traditional health practices that are often sought covertly. Having two parallel health systems potentially contributes to delay in seeking medical care if patients choose to seek help alternately rather than concurrently. For example, a study among breast cancer patients in Indonesia showed that use of traditional medicine before conventional medical health seeking and after cancer diagnoses led to delay and advanced stage cancers at diagnoses and missing of treatment schedules respectively[21]. Similarly, in Malaysia, cancer patients who visited traditional health practitioners (THP) before seeking care at medical facilities experienced increased time to diagnosis and hence advanced stage cancers at diagnoses[22]. To avoid the tendency for delay in health seeking, it could be prudent for states, especially those in the low-income countries where patients seek care in series/alternately to adopt the strategies advocated and outlined by WHO regarding the integration of T&CM into their national health systems[8 23]. In this way, patients could find both systems of care within the same vicinity. An important step in the integration of T&CM with conventional medicine is training of medical students on aspects of T&CM, and training of the T&CM practitioners on critical aspects of medicine, including infection control approaches, immunization, how to avoid risk factors for diseases, and adopting healthy behaviors. Medical students need principles of T&CM in their curricula to improve their awareness about T&CM, enable them communicate competently with their patients regarding T&CM use, and to enable them refer patients when appropriate to THPs[24].

In this study, the medical students who considered that objectively estimating the benefits and harms from T&CM was difficult, and those who thought that endorsing use of T&CM would pose threat to public health were more cautious regarding intention to include T&CM into medical school curricula. To this end, healthcare professionals need to engage more vigorously in researches involving T&CM in order to accumulate evidence for effectiveness and safety of T&CM for guiding informed consents and health care choices[9]. Medical students need to be taught T&CM and encouraged to engage in research involving T&CM in order to reduce gaps in knowledge that physicians have on common T&CMs[25]. Studies have shown that many physicians not only lack knowledge on T&CM, but also hold the potentially erroneous beliefs that T&CM are not proven to be effective, and can be harmful to humans. In Jordan, up to 80% and 70% of Jordanian physicians reported that T&CM are not evidence-based and could cause harm to patients respectively[26]. The belief among physicians that T&CM is "not evidence-based" treatment was also reported in a nationwide survey in Japan, where nearly 82% of 751 surveyed oncologists believed that T&CM was ineffective because of lack of reliable scientific evidence[27]. Even in the US where a number of medical schools have already included aspects of T&CM in their integrative medicine curricula, a survey of 705 physicians in Colorado, showed that only few physicians thought they had adequate knowledge about T&CM to allow them provide factual information to their patients for use or non-use. The majority of the surveyed physicians reported that they needed to learn more about T&CM in order to competently address patients' concerns [28]. It is therefore critical to include T&CM into medical school curricula.

Limitations

This study has some limitations that potentially restrict interpretations and generalization of the findings; only one medical school was included in the study. The uniqueness of Makerere

University School of Medicine including its position as the oldest and most famous medical school in the region could limit utility of our findings. However, the national nature and universal mix of students and faculty at this university could mean that opinion and experiences from all over the country and perhaps region are represented and therefore increase the likelihood that findings from other medical schools could be similar to our findings. This argument is supported by our data which showed that the disposition to include principles of T&CM into medical school curricula and to integrate T&CM with the national health system was not influenced by the region of Uganda where the students originated.

Conclusion

Medical students support inclusion of traditional and complementary medicine (T&CM) principles into medical school curriculum in Uganda. Including T&CM in medical school curricula increases awareness and knowledge of the future clinicians on T&CM, potentially fosters cooperation and collaboration between T&CM practitioners and biomedicine, and helps the students understand better the paradigm from which traditional health practitioners treat their patients[12 13]. Third and fifth year medical students were less enthusiastic regarding inclusion of T&CM into medical school curricula mainly because of challenges involved in estimating benefits and harms from the T&CM, and the potential harms to individual and public health that T&CM pose.

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Competing Interests The authors declare that they have no competing interests.

Patient consent Not applicable.

Ethical approval This study protocol was approved by the Makerere University School of Social Sciences Research and Ethics Committee (MakSSSREC), number **MAKSS REC01.17.013**. Authority to interact with and interview medical students was obtained from the Principal, College of Health Sciences, Makerere University. Each study participant was provided detail information about the study including study purpose and procedures. All participants provided written informed consents before participating in the study. Data from the study has been anonymized and protected from reach of any unauthorized persons to uphold privacy and confidentiality. Participants received a token of $2.50 as transport refund.

Disclaimers None.

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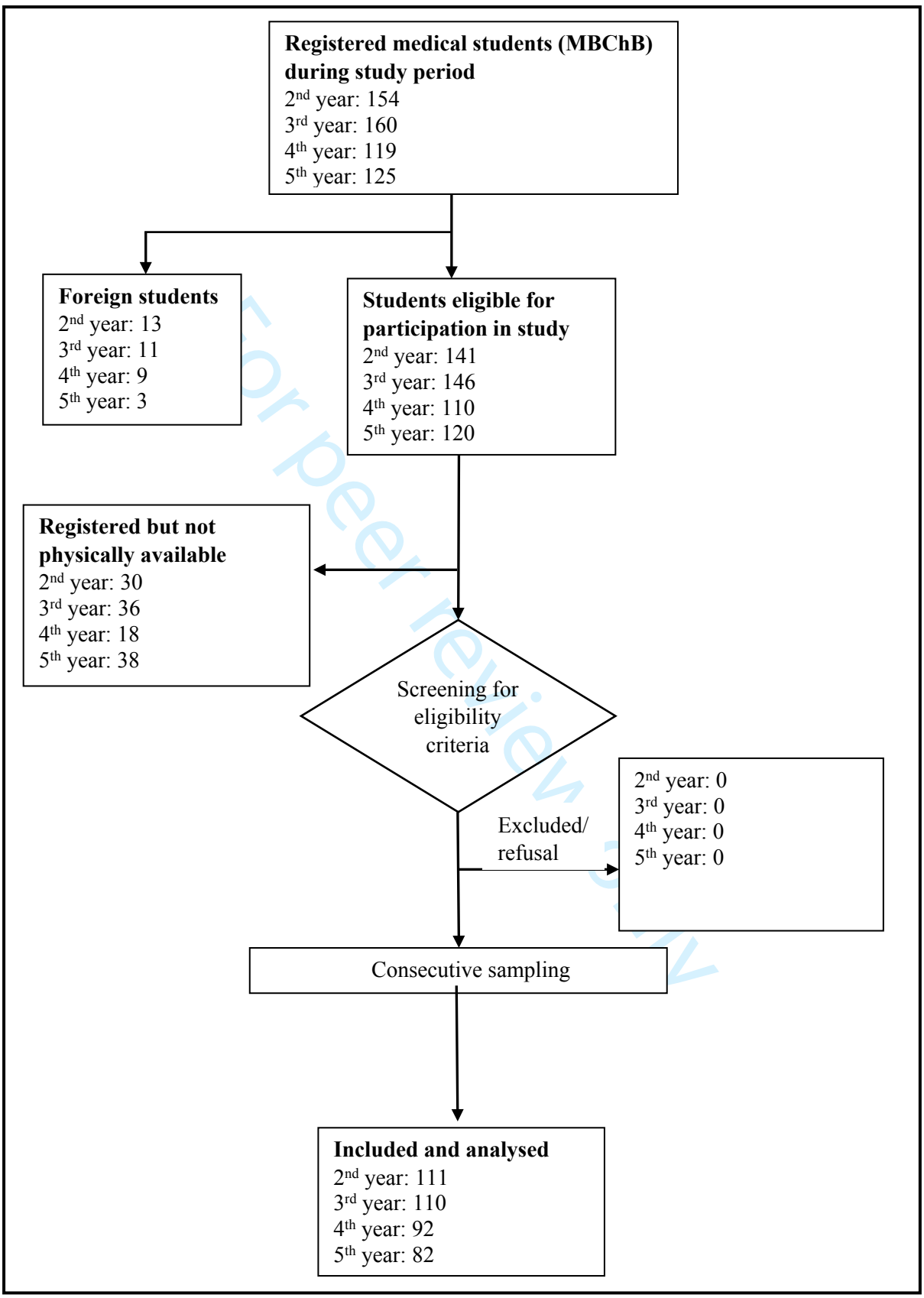
Figure 1: Study Recruitment



STROBE 2007 (v4) Statement—Checklist of items included: Integration of Traditional and Complementary Medicine into medical school curricula: A survey among medical students in Makerere University, Uganda

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4 & 5
Objectives	3	State specific objectives, including any pre-specified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	8
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	8
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	9 & 10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Not applicable
Bias	9	Describe any efforts to address potential sources of bias	Not applicable
Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10
		(*b*) Describe any methods used to examine subgroups and interactions	Not applicable
		(*c*) Explain how missing data were addressed	Not applicable

		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	Not applicable
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	Supplementary material 1
Descriptive data	14*	(a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders	11
		(b) Indicate number of participants with missing data for each variable of interest	Not applicable
Outcome data	15*	Report numbers of outcome events or summary measures	Not applicable
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included	12, 13, 14 & 15
		(*b*) Report category boundaries when continuous variables were categorized	Not applicable
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—e.g. analyses of subgroups and interactions, and sensitivity analyses	Not applicable
Discussion			
Key results	18	Summarise key results with reference to study objectives	17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	19 & 20
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20
Generalisability	21	Discuss the generalisability (external validity) of the study results	20
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	21

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

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Integration of Traditional and Complementary Medicine into medical school curricula: A survey among medical students in Makerere University, Uganda

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Integration of Traditional and Complementary Medicine into medical school curricula: A survey among medical students in Makerere University, Uganda

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Abstract

Objective: To describe the disposition and sociodemographic characteristics of medical students associated with inclusion of traditional and complementary medicine in medical school curricula in Uganda.

Design: A cross-sectional study conducted during May 2017. A pretested questionnaire was used to collect data. Disposition to include principles of traditional and complementary medicine into medical school curricula was determined as proportion, and associated factors determined through multivariate logistic regression.

Participants and setting: Medical students in their 2nd to 5th years at the College of Health Sciences, Makerere University, Uganda. Makerere University is the oldest public university in the east African region.

Results: 393 of 395 participants responded. About 60% (192/325) of participants recommended inclusion of traditional and complementary medicine principles into medical school curricula in Uganda. The disposition to include traditional and complementary medicine into medical school curricula was not associated with sex, age group, nor region of origin of the students. However, compared to the 2nd year students, the 3rd (OR=0.34; 95%CI: 0.17-0.66) and 5th (OR=0.39; 95%CI: 0.16-0.93) year students were significantly less likely to recommend inclusion of traditional and complementary medicine into the medical school curricula. Participants who hold positive attributes and believe in effectiveness of traditional and complementary medicine were statistically significantly more likely to recommend inclusion into the medical school curricula in Uganda.

Conclusions: Inclusion of principles of traditional and complementary medicine into medical school curricula to increase knowledge, inform practice and research, and moderate attitudes of physicians towards traditional medicine practice is acceptable by medical students at

Makerere University. These findings can inform review of medical schools' curricula in Uganda.

Key words: Traditional and complementary medicine, Medical school curricula, Medical students, Makerere University, Uganda.

Strengths and limitations of this study

- To our knowledge, this is the first study to systematically evaluate the disposition of medical students and their sociodemographic factors associated with intention to include principles of traditional and complementary medicine into medical school curricula in Uganda.
- More than 70% (395/558) of registered medical students enthusiastically participated in the study; no eligible participants available at time of study declined participation.
- The study involved students from only one public medical school; so findings may be systematically different from studies conducted in the newer medical schools.
- The cross sectional nature of the study limits attributing the difference in dispositions to include traditional and complementary medicine by year of study to the effect of time in training and interactions in the medical school.

Background

Worldwide, a significant proportion of patients use traditional and complementary medicines (T&CM) in the treatment of various illnesses. For example, a systematic review of 26 studies done in 13 countries showed that 7% – 64% of cancer patients (average use 31%) use T&CM at some point during their illness[1]. In sub Saharan Africa, a recent systematic review showed a high use of T&CM alone or in combination with conventional medicine. Most of the users were likely to be of low socioeconomic status and low educational attainment. The review also showed that most of the users (55.8% - 100%) do not disclose use to healthcare professionals[2]. In Uganda, T&CM practice is common across a range of illnesses including diabetes, hypertension and cancers. People use T&CM for various reasons including beliefs in intrinsic efficacy, long history of use, and perceived barriers to biomedical care[3-6]. It is likely that T&CM use and traditional healing practices will continue side by side with biomedicine for the foreseeable future[7]. In addition, the World Health Organization (WHO) supports the incorporation of T&CM into national health systems and has developed a traditional medicine strategy (2014 – 2023) that stipulates the importance of and how to integrate traditional medicine into the national biomedical health system. The WHO strategies acknowledge that T&CM of proven quality, safety, and efficacy essentially contributes to improving access to care by all people in need[8].

The World Health Organization (WHO) [8 9] has described traditional medicine as: ". . . the sum total of the knowledge, skill, and practices based on the theories, beliefs, and experiences traditional to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness". On the other hand, WHO [8 9] describes complementary medicine as: ". . . a broad set of healthcare practices that are not part of that country's own tradition or conventional medicine

and are not fully integrated into the dominant health-care system." In this study, Traditional and Complementary Medicine (T&CM) was described as any practices that is not part of conventional medicine (biomedicine), whose philosophical underpinnings are beliefs, customs and experiences traditional to the people concern, and whose aims are maintenance of health, prevention of ill health, determination of causes of ill health and the treatment of diseases and ill health including physical, social and mental disorders. The foregoing descriptions of T&CM do not include issues of evidence for effectiveness or harm of the practices. Evidence based use of T&CM in combinations with conventional medicine fall in the realm of integrative medicine. In the high-income countries, particular Canada and USA, a tight working relationship has developed between conventional medicine and traditional medicine practices. This has led to the emergence of a hybrid system of healthcare dispensation, the integrative medicine, which brings together the two practices under one roof. Integrative medicine has variously been defined as: ". . . a sound combination of safe and effective ancient traditional medicine or complementary and alternative medicine, and state-of-the-art conventional medicine [10]." And, ". . . an approach to the practice of medicine that makes use of the best available evidence taking into account the whole person (body, mind, and spirit), including all aspects of lifestyle. It emphasizes the therapeutic relationship and makes use of both conventional and complementary/alternative approaches [11]." In a bid to harmonize integrative medicine practices and derive maximum benefits from both conventional and traditional medicine practices, while minimizing harms, a consortium of 57 academic health institutions and health systems in North America have formed an alliance, The Consortium of Academic Health Centers for Integrative Medicine (CAHCIM) to oversee and regulate as well as uphold standards of care and safety. The Consortium has defined integrative medicine as follows: "the practice of medicine that reaffirms the importance of the relationship between practitioner and patient, focuses on the whole person, is informed by evidence, and makes use of all appropriate

therapeutic approaches, healthcare professionals and disciplines to achieve optimal health and healing [12].” There is a clear common philosophical strand that spans through the above definitions of integrative medicine, and traditional medicine; the need to respect the right of the patients and to provide safe, effective and accessible healthcare to the human population.

Regardless of whether patients choose to use T&CM in parallel, interchangeably or in combination with biomedicine, physicians ought to uphold the ethical principles of beneficence and safeguard public welfare by among others providing appropriate management based on best available evidence[13]. The duty to prevent harm and protect patients’ welfare demands that healthcare professionals (HCPs) have access to information regarding evidence on efficacious and effective T&CM. Physicians are also obliged to know the harmful effects of T&CM in order to be able to provide appropriate guidance to their patients and the public regarding their healthcare choices[14]. Failure of HCPs to advise patients against potentially harmful T&CM is deemed unethical because such patients could get harmed by using the T&CMs[15]. Including aspects of T&CM into medical school curricula increases awareness and knowledge of the future clinicians on T&CM, enables the students to understand better the paradigm from which traditional health practitioners (THP) treat their patients, and potentially fosters cooperation and collaboration between T&CM practitioners and conventional medicine[16 17]. In addition, there is evidence that general knowledge regarding the theories and fundamentals in T&CM practices could help physicians in guiding patients about their health choices[18]. To that extent, physicians ought to know about T&CM so they can guide their patients appropriately and ensure safety of use of T&CM alone or in combinations with conventional medicine. This requires that medical schools include principles of T&CM into their curricula, so the medical students could learn about T&CM principles including why T&CM matters, how to talk about it with patients, how/where to access it, how they work, and potential side effects, without

taking on the expectation of becoming experts in its delivery. The medical schools need not appear to be training the medical students to become T&CM practitioners, a notion that could make the T&CM practitioners feel threatened in their trade and object genuine integration of biomedicine with T&CM. However, there are limited data on the proportions of medicinal schools in sub Saharan Africa that teach aspects of T&CM to their medical students. Similarly, there is limited awareness of the disposition of medical students towards the integration of T&CM into medical school curricula in Uganda and most sub Saharan Africa. Therefore, there is need to determine upfront the proportion and characteristics of medical students who endorse the inclusion of T&CM into the curricula of medical schools. The aim of this study was therefore to understand the attitudes and perceptions of medical students at Makerere University College of Health Sciences (MakCHS) regarding the inclusion of principles of T&CM into the medical school curricula. These findings can inform policies on the integration of T&CM and biomedical practices in Uganda so that the medical students and physicians (i) become familiar with the epidemiology of use and best available evidence of T&CM (where to find it, how to interpret it), and (ii) know how to discuss issues of T&CM with patients in an open and non-judgmental way.

Methods

Study design and setting

We conducted a cross sectional survey at the School of Medicine, Makerere University College of Health Science (MakCHS). The School of Medicine was started in 1923. It is the oldest medical school in Uganda and admits about 80 - 100 first year medical students every year. The school has been keen to adopt innovative approaches to training and learning including problem based learning (PBL) and community based education and service (COBES) to improve learning experience and produce doctors with knowledge and skills that are relevant to demands of the societies they serve[19-22].

Study population and period

Participants to this study included all registered Ugandan male and female medical students in the second, third, fourth and fifth years pursuing the degree of bachelor of medicine and bachelor of surgery (MBChB). The MBChB program involves five years of theoretical and practical training before the successful candidates enrol for a supervised internship practice of one year. First year students were excluded from this study on assumption that their views might be very similar to views of the general community, and lack the insight that medical students typically have as product of their training and experiences in the training institution. The curriculum of the students involves rotation and training on the wards during the fourth and fifth years of study. Foreign students (n=36) were excluded because their concepts of T&CM could be influenced by the status of practices in their home countries. Data was collected in May 2017, during the week immediately after the end of year university examinations when students were generally available on campus and awaiting the start of the recess semester.

Sampling and recruitment of participants

The first author and three research assistants (RA) met with the president of the medical students' association (Makerere University Medical Students' Association – MUMSA), and discussed the objectives and procedures for the study. Thereafter, the president and the RAs met with the class representatives of the 2nd, 3rd, 4th and 5th year students, and agreed on the dates and time for interviews for each class. The students were met separately by their year of study in designated lecture theatres following mobilization by the president and the class representatives. The fifth year students were the first to be interviewed because they would soon leave the University for Internship. Subsequently, the fourth, third and second year students were met, each group on different days. The research assistants provided explanations about purpose and objectives of the study to all eligible participants before enrolment. Thereafter, prospective participants were given the study information sheet with detail information on the study including objectives, inclusion criteria, consent procedures and rationale for selection of the specific category of participants. Every registered student present in the meeting who met eligibility criteria was enrolled consecutively into the study (Figure 1). Participants were given opportunities to ask questions regarding the study. Individual informed consents were sought from each participant before administration of the questionnaire. No prospective participants declined participation in the study. Participants self-completed the questionnaires and returned them to the RAs through their representatives. Participants who wished to complete their questionnaires from their halls of residents were allowed to return the completed questionnaires the following day and deposit with the MUMSA president. All participants returned their completed questionnaires.

Sample size estimation

Sample size estimation was based on the Kish Leslie formula[23]. The estimated sample size was 383 students. An a priori decision was made to include all eligible students in 2nd to 5th years of study. 395 students were included in the study.

Data collection

The tool for this study was developed based on experiences of the investigators and literature regarding traditional medicine, physicians' knowledge of T&CM, and the inclusion of T&CM into medical school curricula. The tool was piloted with ten medical students from third year; these students were subsequently excluded from participation in the main data collection. The pilot data were reviewed, and the tool was refined before use in the main data collection. The authors did not find published validated tools used for this kind of study in the low-income countries, particularly sub Saharan Africa. The first author (ADM) supervised the research assistants during data collection. The students self-administered the questionnaires after provision of written informed consents. Participants were asked about self-use of T&CM, and their disposition towards including T&CM principles into medical school curricula so medical students could understand the basic tenets of T&CM and know how to talk about them with their patients. Attitudes towards effectiveness, safety and usefulness of T&CM were assessed by asking participants questions about T&CM values and utility. For example, participants were asked about self-use and desire for more knowledge on T&CM, willingness to discuss and reactions to issues on T&CM during medical consultations once they have qualified as doctors, whether or not they consider T&CM safe, and perceived value of integrating T&CM with the mainstream national health system.

Data management and analysis

Data was entered on Epi Data, version 3.1 (Epidata software, Odense, Denmark). A biostatistician randomly selected 10% of the questionnaires, and independently entered them as part of quality check. There were no significant data entry errors found in the dataset. The full dataset was exported into STATA I/C, version 13.1 (StataCorp LP, College Station, TX, USA). Analyses included descriptive statistics and determinations of associations between explanatory demographic variables and outcome variables including disposition to include principles of T&CM into medical school curricula. The secondary outcome measure was attitudes towards incorporating T&CM into mainstream biomedicine. Chi-square tests were used to determine associations between the explanatory variables and outcome variables. Unconditional logistic regression models were used to determine magnitudes of associations between explanatory and outcome variables. Odds ratios have been reported with accompanying two-tail 95% confidence intervals.

Patient and public involvement

There was no direct involvement of patients and the public in this study. However, the motivation for this study was the limited evidence to guide the formulation and inform the implementation of a bill "The Indigenous and Complementary Medicine Bill 2015" in the Parliament of the Republic of Uganda. Findings from this study was shared with members of the Parliamentary Committee on Health on the 23rd May 2018 during a session to gather evidence to formulate the Bill into a law.

Results

Study participants

Of 395 participants invited, 393 (99.5%) responded. The distribution of students who responded by year of study were relatively comparable: second year (25.8%; n=98), third year (28.9%; n=110), fourth year (23.9%; n=91) and fifth years (21.3%; n=81). Majority of participants were male (70.5%; n=277) and aged 23 – 26 years (50.5%, n=277) (Table 1).

Table 1: Demographic characteristics by year of study

	Year of study N (%)				
Variable	**2nd**	**3rd**	**4th**	**5th**	**Total**
Age group (Years)	98	110	91	81	380
19 - 22	77 (56.2)	51(37.2)	6 (4.4)	3 (2.2)	137
23 – 26	14 (7.3)	42 (21.9)	68 (35.4)	68 (35.4)	192
≥ 27	7 (13.7)	17 (33.3)	17 (33.3)	10 (19.6)	51
Missing	13	0	1	3	17
Gender	104	109	92	82	393
Male	71 (25.6)	76 (27.4)	70 (25.3)	60 (21.7)	277
Female	37 (31.9)	35 (30.1)	22 (19.0)	22 (19.0)	116
Missing	7	1	0	2	10
Region of origin	111	110	92	84	387
Northern	6 (23.1)	5 (19.2)	9 (34.6)	6 (23.1)	26
North Eastern	2 (16.7)	2 (16.7)	4 (33.3)	4 (33.3)	12
Eastern	16 (21.9)	22 (30.1)	22 (30.1)	13 (17.8)	73
West Nile	4 (28.6)	2 (14.3)	6 (42.9)	2 (14.2)	14
Mid-Western	9 (27.3)	12 (36.4)	7 (21.2)	5 (15.2)	33
South Western	19 (36.5)	19 (36.5)	6 (11.5)	8 (15.4)	52
Central	48 (28.7)	43 (25.8)	35 (21.0)	41 (24.6)	167
Missing	0	4	3	3	10

Inclusion of traditional and complementary medicine into medical school curricula

More than half of participants (59.1%; 192/325) wished that theories and principles of T&CM be included in the medical school curricula in Uganda. On adjusting for sex, age and region of origin, the third (OR=0.34;95%CI:0.17 - 0.66) and fifth (OR=0.39;95%CI:0.16 - 0.93) year medical students were statistically significantly less likely to desire the inclusion of T&CM into medical school curricula as compared to the second year medical students. There was no

statistically significant difference in the disposition to include T&CM into the curricula by gender, age groups and region of origin (Table 2).

Table 2: Demographic characteristics and disposition to include traditional and complementary medicine (T&CM) theories and principles into medical school curricula

	Integrate T&CM into the medical school curricula		**Odds Ratios (OR)**	
Demographic variables N (%)	**Yes, N**	**No, N (%)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)**
Sex, N = 314	**193**	**134**		
Male	138 (58.2)	99 (41.8)	1.00	1.00
Female	55 (61.1)	35 (38.9)	1.13(0.69 - 1.85)	1.07 (0.62 - 1.87)
Age group (Years), N = 322	**187**	**127**		
19 – 22	68 (60.2)	45 (39.8)	1.00	1.00
23 – 26	96 (61.1)	61 (38.9)	1.04 (0.63 - 1.71)	1.55 (0.77 - 3.11)
≥ 27	23 (52.3)	21 (47.7)	0.72 (0.36 - 1.46)	1.07 (0.47 - 2.45)
Years of study, N = 325	**192**	**133**		
2nd	67 (71.3)	27 (28.7)	1.00	1.00
3rd	44 (46.3)	51 (53.7)	**0.35 (0.19 - 0.63)**	**0.34 (0.17 - 0.66)**
4th	45 (63.4)	26 (36.6)	0.70 (0.36 - 1.35)	0.62 (0.26 - 1.43)
5th	36 (55.4)	29 (44.6)	**0.50 (0.26 - 0.97)**	**0.39 (0.16 - 0.93)**
Region of origin of student, N = 325	**189**	**132**		
Northern	15 (62.5)	9 (37.5)	1.00	1.00
North Eastern	5 (45.5)	6 (54.5)	0.48 (0.12 - 1.93)	0.54 (0.12 - 2.37)
Eastern	28 (50.9)	27 (49.1)	0.71(0.28 - 1.85)	0.76 (0.27 - 2.10)
West Nile	6 (75.0)	2 (25.0)	2.00 (0.33 - 11.97)	1.69 (0.25-11.40)
Mid-Western	18 (9.3)	10 (7.3)	1.2 (0.39 - 3.65)	1.33 (0.41-4.28)
South Western	25 (56.8)	19 (43.2)	0.83 (0.31- 2.25)	1.09 (0.37-3.19)
Central	90 (62.5)	54 (37.5)	1.10 (0.46 - 2.63)	1.29 (0.51 - 3.27)
Missing	2 (28.6)	5 (71.4)	0.4 (0.08 - 2.06)	0.35 (0.05 - 2.36)

Adjustment done for demographic factors in the table. Bold face indicates statistically significant findings.

Attitudes and perceived values of traditional and complementary medicines

More than half of participants reported ever using T&CM for various ailments (59.6%; 192/322), while about two thirds (63.9%; 185/291) would want to know more about T&CM. The odds of recommending inclusion of principles of T&CM into the medical school curricula in Uganda was statistically significantly greater among participants who affirmed positive attributes to T&CM compared with participants who did not believe in the effectiveness of T&CM. For example, upon adjusting for age, sex, year of study and region of origin, participants who reported self-use of T&CM (OR=2.01;95%CI:1.16 - 3.44), wanted to know more about T&CM (OR=19.68;95%CI:7.58-51.13), willing to discuss T&CM with patients (OR=25.72;95%CI;11.75 - 56.30) and willing to refer patients to T&CM practitioners (OR=12.70;95%CI:5.12-31.46) were statistically significantly more likely to recommend integration of T&CM principles into medical school curricula compared to those who never used T&CM, never wanted to know more about T&CM, not willing to discuss issues of T&CM with their patients, and not in disposition to refer patients to T&CM practitioners once in practice respectively (Table 3). On the other hand, there was consistently lower odds of wishing to include T&CM into medical school curricula by participants who affirmed negative attributes including that "encouraging use of T&CM is detrimental to public health" (OR=0.17;95%CI:0.09 – 0.33) and "there is no estimable benefits of using T&CM" (0OR=0.13;95%CI: 0.07-0.25) as compared to participants who thought T&CM was useful to the population and has definite health benefits respectively (Table 3).

Table 3: Disposition to traditional and complementary medicines (T&CM)

Explanatory Variables N (%)	Integrate T&CM in the medical school curricula		Odds Ratios (OR)	
	Yes, N	No, N	Crude OR (95%CI)	Adjusted OR (95%CI)*
Self-use of T&CM (Ever), N = 322	**192**	**130**		
Yes	142 (63.7)	81 (36.3)	1.72 (1.06 - 2.77)	2.01 (1.16 – 3.44)
No	50 (50.5)	49 (49.5)	1.00	1.00
Wants to know more about T&CM, N = 291	**185**	**106**		
Yes	179 (73.1)	66 (26.9)	18.08 (7.32 – 44.6)	19.68 (7.58 – 51.13)
No	6 (13.0)	40 (87.0)	1.00	1.00
Integrate practice of T&CM into mainstream biomedicine, N = 286	**175**	**111**		
Yes	168 (88.9)	21 (11.1)	102.9 (42.11 –251.2)	179.3 (57.4 – 560.1)
No	7 (7.2)	90 (92.8)	1.00	1.00
Willingness to refer to T&CM practitioners N = 271	**150**	**121**		
Yes	69 (90.8)	7 (9.2)	13.87 (6.06 – 31.75)	12.70 (5.12 – 31.46)
No	81 (41.5)	114 (58.5)	1.00	1.00
Willingness to discuss T&CM with patients N = 293	**176**	**117**		
Yes	166 (76.7)	45 (21.3)	26.56 (12.69 – 55.61)	25.72 (11.75 – 56.3)
No	10 (12.2)	72 (87.8)	1.00	1.00
There are no estimable benefits of T&CM N = 271	**161**	**110**		
Yes	26 (30.6)	59 (69.4)	0.17 (0.09 – 0.29)	0.13 (0.07 – 0.25)
No	135 (72.6)	51 (27.4)	1.00	1.00
Encouraging use of T&CM at biomedical facilities poses threat to public health N = 262	**148**	**109**		
Yes	46 (40.0)	69 (60.0)	0.26 (0.16 – 0.44)	0.17 (0.09 – 0.33)
No	102 (71.8)	40 (28.2)	1.00	1.00

*Adjusted for: age, sex, region of origin of students and year of study at medical school.

Incorporating traditional and complementary practices in the national health system

Two thirds (66.9%; 218/326) of participants endorsed integrating principles and practices of T&CM into the national health system. However, participants in third year were less likely to desire incorporation of T&CM practices into the mainstream national health system (OR=0.40;95%CI:0.20 – 0.80) as compared to the second year students who had not yet had clinical exposure during their training in the medical school. This association was not statistically significant for the fourth and fifth year medical students. Age and gender were not statistically significantly associated with the disposition to integrate T&CM into the mainstream national health system (Table 4).

Table 4: Disposition to integrate traditional and complementary (T&CM) medicine practice into mainstream medicine

Demographic variables	Integrate T&CM into the national health system		Odds Ratios	
	Yes, N	No, N	Crude odds Ratio (OR) (95%CI)	Adjusted Odds Ratio (AOR) ** (95%CI)
Sex				
N = 328	**219**	**109**		
Male	149 (63.9)	84 (36.1)	1.00	1.00
Female	70 (73.7)	25 (26.3)	1.58 (0.93 - 2.68)	1.67 (0.92 - 3.03)
Age group (Years)				
N = 314	**209**	**105**		
19 – 22	74 (64.4)	41 (35.6)	1.00	1.00
23 – 26	105 (67.7)	50 (32.3)	1.16 (0.70 - 1.94)	1.68 (0.82 - 3.44)
≥ 27	30 (68.2)	14 (31.8)	1.19 (0.57 - 2.49)	1.61 (0.68 - 3.84)
Years of study				
N = 326	**218**	**108**		
2nd	71 (75.5)	23 (24.5)	1.00	1.00
3rd	51 (54.8)	42 (45.2)	**0.39 (0.21 - 0.73)**	**0.40 (0.20 - 0.80)**
4th	53 (72.6)	20 (27.4)	0.86 (0.43 - 1.72)	0.77 (0.31 - 1.89)
5th	43 (65.2)	23 (34.8)	0.61 (0.30 - 1.21)	0.45 (0.18 - 1.10)
Region of origin of student				
N = 322	**215**	**107**		
Northern	14 (58.3)	10 (41.7)	1.00	1.00

North Eastern	6 (54.6)	5 (45.4)	0.85 (0.20 - 3.61)	0.95 (0.22 - 4.13)
Eastern	39 (66.1)	20 (33.9)	1.39 (0.53 - 3.69)	1.42 (0.51 - 3.92)
West Nile	10 (83.3)	2 (16.7)	3.57 (0.64 - 19.97)	3.05 (0.50 - 8.40)
Mid-Western	16 (64.0)	9 (36.0)	1.27 (0.40 - 4.02)	1.42 (0.43 - 4.67)
South Western	23 (62.2)	14 (37.8)	1.17 (0.41 - 3.35)	1.34 (0.44 - 4.07)
Central	105 (71.4)	42 (28.6)	1.79 (0.74 - 4.33)	2.05 (0.81 - 5.16)
Missing	2 (28.6)	5 (71.4)	0.29 (0.05 - 1.78)	0.38 (0.06 - 2.61)

**Adjusted for the demographic factors included in the table.

Discussion

The main aims of this study were to quantify the disposition to include principles of T&CM into medical school curricula and to determine factors that are associated with the disposition among preclinical and clinical year students at the oldest medical school in Uganda. In addition, we also sought to determine attitudes of the students towards integration of T&CM into mainstream national health services. We found that two thirds of medical students considered it necessary to include T&CM principles into the medical school curricula in Uganda. More than half of participants also reported self-use of T&CM, wanted to learn more about T&CM as well as wished to have T&CM integrated into the national health system of Uganda. However, up to 60% (161/271) of the students also noted that the issue of T&CM needs to be handled with caution because it is difficult to estimate the benefits and harms that may arise from using T&CM. These findings support the need to conduct similar studies with government regulatory bodies including the Medical and Dental Practitioners Council and ministry of health officials to determine their disposition in order to inform the process of curricula review and the integration of T&CM and biomedicine into one national health system. Our qualitative study that preceded this study revealed some ethical and operational challenges that need to be addressed before and during integration[24]. Drawing from both this study and our earlier qualitative study with medical students, their faculty and the traditional health practitioners, there is a clear need to equip the medical students and healthcare professionals with critical knowledge and approaches to T&CM practice in order to enable them communicate better with their patients who often use T&CM modalities. Health sciences students in South Africa, Sierra Leone, the Middle East and Asia have similarly reported the importance of learning about T&CM in their medical practices[25-29]. Empowering healthcare professionals with the tools to talk to their patients and find/use evidence-based resources could potentially minimize delay

in health seeking due to fear of being rebuked by the healthcare professionals for using T&CMs.

Medical students do not need to be trained to practice T&CM, but rather to know about and become aware of the paradigm from which T&CM practitioners do their healing. Biomedical and traditional health practitioners who currently have inadequate knowledge of what each other do could then work side by side in an integrated national health system with clear regulations to guide and control practices. Hitherto, there are two parallel health systems in Uganda: the dominant biomedical national health system and the traditional health practices that are often sought covertly. Having two parallel health systems potentially contributes to delay in seeking medical care if patients choose to seek help alternately rather than concurrently. For example, a study among breast cancer patients in Indonesia showed that use of traditional medicine before conventional medicine health seeking and after cancer diagnoses led to delay and advanced stage cancers at diagnoses and missing of treatment schedules respectively[30]. Similarly, in Malaysia, cancer patients who visited traditional health practitioners (THP) before seeking care at medical facilities experienced increased time to diagnosis and hence advanced stage cancers at diagnoses[31]. To avoid the tendency for delay in health seeking, it could be prudent for states, especially those in the low-income countries where patients seek care in series/alternately to adopt the strategies advocated and outlined by WHO regarding the integration of T&CM into their national health systems[8 32]. In this way, patients could find both systems of care within the same vicinity. An important step in the integration of T&CM with conventional medicine is training of medical students on aspects of T&CM, and training of the T&CM practitioners on critical aspects of medicine, including infection control approaches, immunization, how to avoid risk factors for diseases, and adopting healthy behaviors. Medical students need principles of T&CM in their curricula to

improve their awareness about T&CM, enable them communicate competently with their patients regarding T&CM use, and to enable them refer patients when appropriate to THPs[33].

In this study, the medical students who considered that objectively estimating the benefits and harms from T&CM was difficult, and those who thought that endorsing use of T&CM would pose threat to public health were more cautious regarding intention to include T&CM into medical school curricula. To this end, healthcare professionals need to engage more vigorously in researches involving T&CM in order to accumulate evidence for effectiveness and safety of T&CM for guiding informed consents and health care choices[13]. Medical students need to be taught T&CM and encouraged to engage in research involving T&CM in order to reduce gaps in knowledge that physicians have on common T&CMs[34]. Studies have shown that many physicians not only lack knowledge on T&CM, but also hold the potentially erroneous beliefs that T&CM are not proven to be effective, and can be harmful to humans. In Jordan, up to 80% and 70% of Jordanian physicians reported that T&CM are not evidence-based and could cause harm to patients respectively[35]. The belief among physicians that T&CM is "not evidence-based" treatment was also reported in a nationwide survey in Japan, where nearly 82% of 751 surveyed oncologists believed that T&CM was ineffective because of lack of reliable scientific evidence[36]. Even in the US where a number of medical schools have already included aspects of T&CM in their integrative medicine curricula, a survey of 705 physicians in Colorado, showed that only few physicians thought they had adequate knowledge about T&CM to allow them provide factual information to their patients for use or non-use. The majority of the surveyed physicians reported that they needed to learn more about T&CM in order to competently address patients' concerns [37]. It is therefore critical to include T&CM into medical school curricula.

Limitations

This study has some limitations that potentially restrict interpretations and generalization of the findings; only one medical school was included in the study. The uniqueness of Makerere University School of Medicine including its position as the oldest and most famous medical school in the region could limit utility of our findings. However, the national nature and universal mix of students and faculty at this university could mean that opinion and experiences from all over the country and perhaps region are represented and therefore increase the likelihood that findings from other medical schools could be similar to our findings. This argument is supported by our data which showed that the disposition to include principles of T&CM into medical school curricula and to integrate T&CM with the national health system was not influenced by the region of Uganda where the students originated. Second, the tool for data collection was not validated, and this could import some constructs and reliability bias. Pilot testing was done to ameliorate these bias. However, future studies could develop and validate a culture and context sensitive tool similar to the IMAQ (Integrative Medicine Attitude Questionnaire) [38] for use in the low-income countries.

Conclusion

Medical students support inclusion of traditional and complementary medicine (T&CM) principles into medical school curriculum and the national health system in Uganda. Including T&CM in medical school curricula increases awareness and knowledge of the future clinicians on T&CM, potentially fosters cooperation and collaboration between T&CM practitioners and biomedicine, and helps the students understand better the paradigm from which traditional health practitioners treat their patients[16 17]. Third and fifth year medical students were less enthusiastic regarding inclusion of T&CM into medical school curricula mainly because of

challenges involved in estimating benefits and harms from T&CM, and the potential harms to individual and public health that T&CM pose [24].

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Competing Interests The authors declare that they have no competing interests.

Patient consent Not applicable.

Ethical approval This study protocol was approved by the Makerere University School of Social Sciences Research and Ethics Committee (MakSSSREC), number **MAKSS REC01.17.013**. Authority to interact with and interview medical students was obtained from the Principal, College of Health Sciences, Makerere University. Each study participant was provided detail information about the study including study purpose and procedures. All participants provided written informed consents before participating in the study. Data from

the study has been anonymized and protected from reach of any unauthorized persons to uphold privacy and confidentiality. Participants received a token of $2.50 as transport refund.

Disclaimers None.

Data sharing statement No additional data are available. Study dataset can be made available to third party following reasonable request to corresponding.

Figure 1: Study Recruitment

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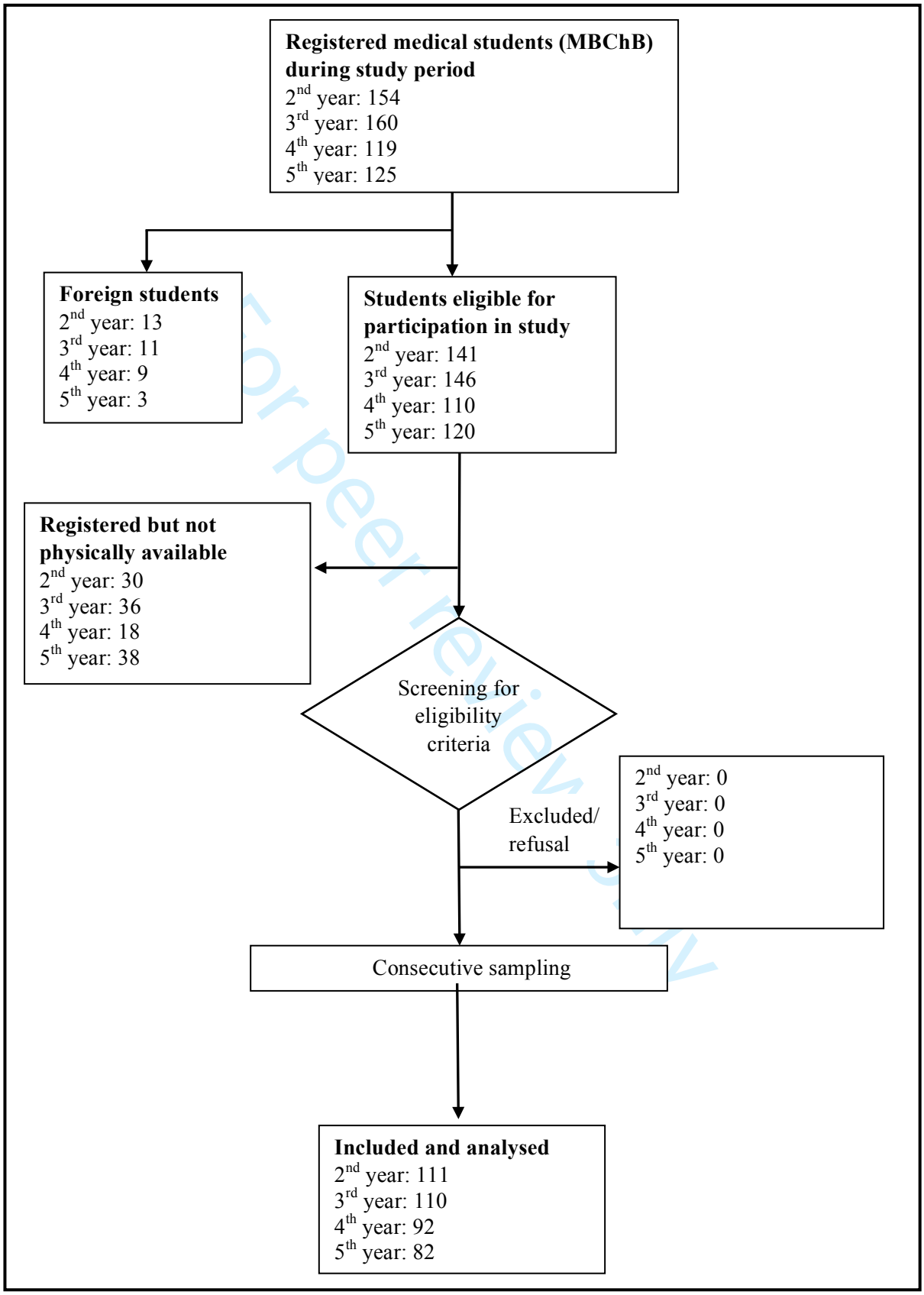
Figure 1: Study Recruitment



STROBE 2007 (v4) Statement—Checklist of items included: Integration of Traditional and Complementary Medicine into medical school curricula: A survey among medical students in Makerere University, Uganda

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4 & 5
Objectives	3	State specific objectives, including any pre-specified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	8
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	8
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	9 & 10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Not applicable
Bias	9	Describe any efforts to address potential sources of bias	Not applicable
Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10
		(*b*) Describe any methods used to examine subgroups and interactions	Not applicable
		(*c*) Explain how missing data were addressed	Not applicable

		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	Not applicable
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	Supplementary material 1
Descriptive data	14*	(a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders	11
		(b) Indicate number of participants with missing data for each variable of interest	Not applicable
Outcome data	15*	Report numbers of outcome events or summary measures	Not applicable
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included	12, 13, 14 & 15
		(*b*) Report category boundaries when continuous variables were categorized	Not applicable
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—e.g. analyses of subgroups and interactions, and sensitivity analyses	Not applicable
Discussion			
Key results	18	Summarise key results with reference to study objectives	17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	19 & 20
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20
Generalisability	21	Discuss the generalisability (external validity) of the study results	20
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	21

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

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Integration of Traditional and Complementary Medicine into medical school curricula: A survey among medical students in Makerere University, Uganda

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Integration of Traditional and Complementary Medicine into medical school curricula: A survey among medical students in Makerere University, Uganda

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Abstract

Objective: To describe the disposition and sociodemographic characteristics of medical students associated with inclusion of traditional and complementary medicine in medical school curricula in Uganda.

Design: A cross-sectional study conducted during May 2017. A pretested questionnaire was used to collect data. Disposition to include principles of traditional and complementary medicine into medical school curricula was determined as proportion, and associated factors determined through multivariate logistic regression.

Participants and setting: Medical students in their 2nd to 5th years at the College of Health Sciences, Makerere University, Uganda. Makerere University is the oldest public university in the East African region.

Results: 393 of 395 participants responded. About 60% (192/325) of participants recommended inclusion of traditional and complementary medicine principles into medical school curricula in Uganda. The disposition to include traditional and complementary medicine into medical school curricula was not associated with sex, age group, nor region of origin of the students. However, compared to the 2nd year students, the 3rd (OR=0.34; 95%CI: 0.17-0.66) and 5th (OR=0.39; 95%CI: 0.16-0.93) year students were significantly less likely to recommend inclusion of traditional and complementary medicine into the medical school curricula. Participants who hold positive attributes and believe in effectiveness of traditional and complementary medicine were statistically significantly more likely to recommend inclusion into the medical school curricula in Uganda.

Conclusions: Inclusion of principles of traditional and complementary medicine into medical school curricula to increase knowledge, inform practice and research, and moderate attitudes of physicians towards traditional medicine practice is acceptable by medical students at

Makerere University. These findings can inform review of medical schools' curricula in Uganda.

Key words: Traditional and complementary medicine, Medical school curricula, Medical students, Makerere University, Uganda.

Strengths and limitations of this study

- To our knowledge, this is the first study to systematically evaluate the disposition of medical students and their sociodemographic factors associated with intention to include principles of traditional and complementary medicine into medical school curricula in Uganda.
- More than 70% (395/558) of registered medical students enthusiastically participated in the study; no eligible participants available at time of study declined participation.
- The study involved students from only one public medical school; so findings may be systematically different from studies conducted in the newer medical schools.
- The cross sectional nature of the study limits attributing the difference in dispositions to include traditional and complementary medicine by year of study to the effect of time in training and interactions in the medical school.

Background

Worldwide, a significant proportion of patients use traditional and complementary medicines (T&CM) in the treatment of various illnesses. For example, a systematic review of 26 studies done in 13 countries showed that 7% – 64% of cancer patients (average use 31%) use T&CM at some point during their illness[1]. In sub Saharan Africa, a recent systematic review showed a high use of T&CM alone or in combination with conventional medicine. Most of the users were likely to be of low socioeconomic status and low educational attainment. The review also showed that most of the users (55.8% - 100%) do not disclose use to healthcare professionals[2]. In Uganda, T&CM practice is common across a range of illnesses including diabetes, hypertension and cancers. People use T&CM for various reasons including beliefs in intrinsic efficacy, long history of use, and perceived barriers to biomedical care[3-6]. It is likely that T&CM use and traditional healing practices will continue side by side with biomedicine for the foreseeable future[7]. In addition, the World Health Organization (WHO) supports the incorporation of T&CM into national health systems and has developed a traditional medicine strategy (2014 – 2023) that stipulates the importance of and how to integrate traditional medicine into the national biomedical health system. The WHO strategies acknowledge that T&CM of proven quality, safety, and efficacy essentially contributes to improving access to care by all people in need[8].

The World Health Organization (WHO) [8 9] has described traditional medicine as: ". . . the sum total of the knowledge, skill, and practices based on the theories, beliefs, and experiences traditional to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness". On the other hand, WHO [8 9] describes complementary medicine as: ". . . a broad set of healthcare practices that are not part of that country's own tradition or conventional medicine

and are not fully integrated into the dominant health-care system." In this study, Traditional and Complementary Medicine (T&CM) was described as any practices that is not part of conventional medicine (biomedicine), whose philosophical underpinnings are beliefs, customs and experiences traditional to the people concern, and whose aims are maintenance of health, prevention of ill health, determination of causes of ill health and the treatment of diseases and ill health including physical, social and mental disorders. The foregoing descriptions of T&CM do not include issues of evidence for effectiveness or harm of the practices. Evidence based use of T&CM in combinations with conventional medicine fall in the realm of integrative medicine. In the high-income countries, particularly Canada and USA, a tight working relationship has developed between conventional medicine and traditional medicine practices. This has led to the emergence of a hybrid system of healthcare dispensation, the integrative medicine, which brings together the two practices under one roof. Integrative medicine has variously been defined as: ". . . a sound combination of safe and effective ancient traditional medicine or complementary and alternative medicine, and state-of-the-art conventional medicine [10]." And, ". . . an approach to the practice of medicine that makes use of the best available evidence taking into account the whole person (body, mind, and spirit), including all aspects of lifestyle. It emphasizes the therapeutic relationship and makes use of both conventional and complementary/alternative approaches [11]." In a bid to harmonize integrative medicine practices and derive maximum benefits from both conventional and traditional medicine practices, while minimizing harms, a consortium of 57 academic health institutions and health systems in North America have formed an alliance, The Consortium of Academic Health Centers for Integrative Medicine (CAHCIM) to oversee and regulate as well as uphold standards of care and safety. The Consortium has defined integrative medicine as follows: "the practice of medicine that reaffirms the importance of the relationship between practitioner and patient, focuses on the whole person, is informed by evidence, and makes use of all appropriate

therapeutic approaches, healthcare professionals and disciplines to achieve optimal health and healing [12].” There is a clear common philosophical strand that spans through the above definitions of integrative medicine, and traditional medicine; the need to respect the right of the patients and to provide safe, effective and accessible healthcare to the human population.

Regardless of whether patients choose to use T&CM in parallel, interchangeably or in combination with biomedicine, physicians ought to uphold the ethical principles of beneficence and safeguard public welfare by among others providing appropriate management based on best available evidence[13]. The duty to prevent harm and protect patients’ welfare demands that healthcare professionals (HCPs) have access to information regarding evidence on efficacious and effective T&CM. Physicians are also obliged to know the harmful effects of T&CM in order to be able to provide appropriate guidance to their patients and the public regarding their healthcare choices[14]. Failure of HCPs to advise patients against potentially harmful T&CM is deemed unethical because such patients could get harmed by using the T&CMs[15]. Including aspects of T&CM into medical school curricula increases awareness and knowledge of the future clinicians on T&CM, enables the students to understand better the paradigm from which traditional health practitioners (THP) treat their patients, and potentially fosters cooperation and collaboration between T&CM practitioners and conventional medicine[16 17]. In addition, there is evidence that general knowledge regarding the theories and fundamentals in T&CM practices could help physicians in guiding patients about their health choices[18]. To that extent, physicians ought to know about T&CM so they can guide their patients appropriately and ensure safety of use of T&CM alone or in combinations with conventional medicine. This requires that medical schools include principles of T&CM into their curricula, so the medical students could learn about T&CM principles including why T&CM matters, how to talk about it with patients, how/where to access it, how they work, and potential side effects, without

taking on the expectation of becoming experts in its delivery. The medical schools need not appear to be training the medical students to become T&CM practitioners, a notion that could make the T&CM practitioners feel threatened in their trade and object genuine integration of biomedicine with T&CM. However, there are limited data on the proportions of medical schools in sub Saharan Africa that teach aspects of T&CM to their medical students. Similarly, there is limited awareness of the disposition of medical students towards the integration of T&CM into medical school curricula in Uganda and most sub Saharan Africa. Therefore, there is need to determine upfront the proportion and characteristics of medical students who endorse the inclusion of T&CM into the curricula of medical schools. The aim of this study was therefore to understand the attitudes and perceptions of medical students at Makerere University College of Health Sciences (MakCHS) regarding the inclusion of principles of T&CM into the medical school curricula. We also aimed to establish the sociodemographic characteristics of the students who are disposed to inclusion of T&CM into the medical school curricula. These findings can inform policies on the integration of T&CM and biomedical practices in Uganda so that the medical students and physicians (i) become familiar with the epidemiology of use and best available evidence on T&CM (where to find it, how to interpret it), and (ii) know how to discuss issues of T&CM with patients in an open and non-judgmental way.

Methods

Study design and setting

We conducted a cross sectional survey at the School of Medicine, Makerere University College of Health Science (MakCHS). The School of Medicine was started in 1923. It is the oldest medical school in Uganda and admits about 80 - 100 first year medical students every year. The school has been keen to adopt innovative approaches to training and learning including problem based learning (PBL) and community based education and service (COBES) to improve learning experience and produce doctors with knowledge and skills that are relevant to demands of the societies they serve[19-22].

Study population and period

Participants to this study included all registered Ugandan male and female medical students in the second, third, fourth and fifth years pursuing the degree of bachelor of medicine and bachelor of surgery (MBChB). The MBChB program involves five years of theoretical and practical training before the successful candidates enrol for a supervised internship practice of one year. First year students were excluded from this study on assumption that their views might be very similar to views of the general community, and lack the insight that medical students typically have as product of their training and experiences in the training institution. The curriculum of the students involves rotation and training on the wards during the fourth and fifth years of study. Foreign students (n=36) were excluded because their concepts of T&CM could be influenced by the status of practices in their home countries. Data was collected in May 2017, during the week immediately after the end of year university examinations when students were generally available on campus and awaiting the start of the recess semester.

Sampling and recruitment of participants

The first author and three research assistants (RA) met with the president of the medical students' association (Makerere University Medical Students' Association – MUMSA), and discussed the objectives and procedures for the study. Thereafter, the president and the RAs met with the class representatives of the 2nd, 3rd, 4th and 5th year students, and agreed on the dates and time for interviews for each class. The students were met separately by their year of study in designated lecture theatres following mobilization by the president and their class representatives. The fifth year students were the first to be interviewed because they would soon leave the University for Internship. Subsequently, the fourth, third and second year students were met, each group on different days. The research assistants provided explanations about purpose and objectives of the study to all eligible participants before enrolment. Thereafter, prospective participants were given the study information sheet with detail information on the study including objectives, inclusion criteria, consent procedures and rationale for selection of the specific category of participants. Every registered student present in the meeting who met eligibility criteria was enrolled consecutively into the study (Figure 1). Participants were given opportunities to ask questions regarding the study. Individual informed consents were sought from each participant before administration of the questionnaire. No prospective participants declined participation in the study. Participants self-completed the questionnaires and returned them to the RAs through their representatives. Participants who wished to complete their questionnaires from their halls of residents were allowed to return the completed questionnaires the following day and deposit with the MUMSA president. All participants returned their completed questionnaires.

Sample size estimation

Sample size estimation was based on the Kish Leslie formula[23]. The estimated sample size was 383 students. An a priori decision was made to include all eligible students in 2nd to 5th years of study. 395 students were included in the study.

Data collection

The authors did not find published validated tools used for this kind of study in the low-income countries, particularly sub Saharan Africa. The tool for this study was therefore developed based on experiences of the investigators and literature regarding traditional medicine, physicians' knowledge of T&CM, and the inclusion of T&CM into medical school curricula. The tool was piloted with ten medical students from third year; these students were subsequently excluded from participation in the main data collection. The pilot data were reviewed, and the tool was refined before use in the main data collection. The first author (ADM) supervised the research assistants during data collection. The students self-administered the questionnaires after provision of written informed consents. Participants were asked about self-use of T&CM, and their disposition towards including T&CM principles into medical school curricula so medical students could understand the basic tenets of T&CM and know how to talk about them with their patients. Attitudes towards effectiveness, safety and usefulness of T&CM were assessed by asking participants questions about T&CM values and utility. For example, participants were asked about self-use and desire for more knowledge on T&CM, willingness to discuss, and reactions to issues on T&CM during medical consultations once they have qualified as doctors, whether or not they consider T&CM safe, and perceived value of integrating T&CM with the mainstream national health system.

Data management and analysis

Data was entered on Epi Data, version 3.1 (Epidata software, Odense, Denmark). A biostatistician randomly selected 10% of the questionnaires, and independently entered them as part of quality check. There were no significant data entry errors found in the dataset. The full dataset was exported into STATA I/C, version 13.1 (StataCorp LP, College Station, TX, USA). Analyses included descriptive statistics and determinations of associations between explanatory demographic variables and outcome variables including disposition to include principles of T&CM into medical school curricula. The secondary outcome measure was attitudes towards incorporating T&CM into mainstream biomedicine. Chi-square tests were used to determine associations between the explanatory variables and outcome variables. Unconditional logistic regression models were used to determine magnitudes of associations between explanatory and outcome variables. Odds ratios have been reported with accompanying two-tail 95% confidence intervals.

Patient and public involvement

There was no direct involvement of patients and the public in this study. However, the motivation for this study was the limited evidence to guide and inform the formulation and implementation of a bill "The Indigenous and Complementary Medicine Bill 2015" in the Parliament of the Republic of Uganda. Findings from this study was shared with members of the Parliamentary Committee on Health on the 23rd May 2018 during a session to gather evidence to formulate the Bill into a law.

Results

Study participants

Of 395 participants invited, 393 (99.5%) responded. The distribution of students who responded by year of study were relatively comparable: second year (25.8%; n=98), third year (28.9%; n=110), fourth year (23.9%; n=91) and fifth years (21.3%; n=81). Majority of participants were male (70.5%; n=277) and aged 23 – 26 years (50.5%, n=277) (Table 1).

Table 1: Demographic characteristics by year of study

	Year of study N (%)				
Variable	**2nd**	**3rd**	**4th**	**5th**	**Total**
Age group (Years)	98	110	91	81	380
19 - 22	77 (56.2)	51(37.2)	6 (4.4)	3 (2.2)	137
23 – 26	14 (7.3)	42 (21.9)	68 (35.4)	68 (35.4)	192
≥ 27	7 (13.7)	17 (33.3)	17 (33.3)	10 (19.6)	51
Missing	13	0	1	3	17
Gender	104	109	92	82	393
Male	71 (25.6)	76 (27.4)	70 (25.3)	60 (21.7)	277
Female	37 (31.9)	35 (30.1)	22 (19.0)	22 (19.0)	116
Missing	7	1	0	2	10
Region of origin	111	110	92	84	387
Northern	6 (23.1)	5 (19.2)	9 (34.6)	6 (23.1)	26
North Eastern	2 (16.7)	2 (16.7)	4 (33.3)	4 (33.3)	12
Eastern	16 (21.9)	22 (30.1)	22 (30.1)	13 (17.8)	73
West Nile	4 (28.6)	2 (14.3)	6 (42.9)	2 (14.2)	14
Mid-Western	9 (27.3)	12 (36.4)	7 (21.2)	5 (15.2)	33
South Western	19 (36.5)	19 (36.5)	6 (11.5)	8 (15.4)	52
Central	48 (28.7)	43 (25.8)	35 (21.0)	41 (24.6)	167
Missing	0	4	3	3	10

Inclusion of traditional and complementary medicine into medical school curricula

More than half of participants (59.1%; 192/325) wished that theories and principles of T&CM be included in the medical school curricula in Uganda. On adjusting for sex, age and region of origin, the third (OR=0.34;95%CI:0.17 - 0.66) and fifth (OR=0.39;95%CI:0.16 - 0.93) year medical students were statistically significantly less likely to desire the inclusion of T&CM into medical school curricula as compared to the second year medical students. There was no

statistically significant difference in the disposition to include T&CM into the curricula by gender, age groups and region of origin (Table 2).

Table 2: Demographic characteristics and disposition to include traditional and complementary medicine (T&CM) theories and principles into medical school curricula

	Integrate T&CM into the medical school curricula		**Odds Ratios (OR)**	
Demographic variables N (%)	**Yes, N**	**No, N (%)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)**
Sex, N = 314	**193**	**134**		
Male	138 (58.2)	99 (41.8)	1.00	1.00
Female	55 (61.1)	35 (38.9)	1.13(0.69 - 1.85)	1.07 (0.62 - 1.87)
Age group (Years), N = 322	**187**	**127**		
19 – 22	68 (60.2)	45 (39.8)	1.00	1.00
23 – 26	96 (61.1)	61 (38.9)	1.04 (0.63 - 1.71)	1.55 (0.77 - 3.11)
≥ 27	23 (52.3)	21 (47.7)	0.72 (0.36 - 1.46)	1.07 (0.47 - 2.45)
Years of study, N = 325	**192**	**133**		
2nd	67 (71.3)	27 (28.7)	1.00	1.00
3rd	44 (46.3)	51 (53.7)	**0.35 (0.19 - 0.63)**	**0.34 (0.17 - 0.66)**
4th	45 (63.4)	26 (36.6)	0.70 (0.36 - 1.35)	0.62 (0.26 - 1.43)
5th	36 (55.4)	29 (44.6)	**0.50 (0.26 - 0.97)**	**0.39 (0.16 - 0.93)**
Region of origin of student, N = 325	**189**	**132**		
Northern	15 (62.5)	9 (37.5)	1.00	1.00
North Eastern	5 (45.5)	6 (54.5)	0.48 (0.12 - 1.93)	0.54 (0.12 - 2.37)
Eastern	28 (50.9)	27 (49.1)	0.71(0.28 - 1.85)	0.76 (0.27 - 2.10)
West Nile	6 (75.0)	2 (25.0)	2.00 (0.33 - 11.97)	1.69 (0.25-11.40)
Mid-Western	18 (9.3)	10 (7.3)	1.2 (0.39 - 3.65)	1.33 (0.41-4.28)
South Western	25 (56.8)	19 (43.2)	0.83 (0.31- 2.25)	1.09 (0.37-3.19)
Central	90 (62.5)	54 (37.5)	1.10 (0.46 - 2.63)	1.29 (0.51 - 3.27)
Missing	2 (28.6)	5 (71.4)	0.4 (0.08 - 2.06)	0.35 (0.05 - 2.36)

Adjustment done for demographic factors in the table. Bold face indicates statistically significant findings.

Attitudes and perceived values of traditional and complementary medicines

More than half of participants reported ever using T&CM for various ailments (59.6%; 192/322), while about two thirds (63.9%; 185/291) would want to know more about T&CM. The odds of recommending inclusion of principles of T&CM into the medical school curricula in Uganda was statistically significantly greater among participants who affirmed positive attributes to T&CM compared with participants who did not believe in the effectiveness of T&CM. For example, upon adjusting for age, sex, year of study and region of origin, participants who reported self-use of T&CM (OR=2.01;95%CI:1.16 - 3.44), wanted to know more about T&CM (OR=19.68;95%CI:7.58-51.13), willing to discuss T&CM with patients (OR=25.72;95%CI;11.75 - 56.30) and willing to refer patients to T&CM practitioners (OR=12.70;95%CI:5.12-31.46) were statistically significantly more likely to recommend integration of T&CM principles into medical school curricula compared to those who never used T&CM, never wanted to know more about T&CM, not willing to discuss issues of T&CM with their patients, and not in disposition to refer patients to T&CM practitioners once in practice respectively (Table 3). On the other hand, there was consistently lower odds of wishing to include T&CM into medical school curricula by participants who affirmed negative attributes including that "encouraging use of T&CM is detrimental to public health" (OR=0.17;95%CI:0.09 – 0.33) and "there is no estimable benefits of using T&CM" (0OR=0.13;95%CI: 0.07-0.25) as compared to participants who thought T&CM was useful to the population and has definite health benefits respectively (Table 3).

Table 3: Disposition to traditional and complementary medicines (T&CM)

Explanatory Variables N (%)	Integrate T&CM in the medical school curricula		Odds Ratios (OR)	
	Yes, N	No, N	Crude OR (95%CI)	Adjusted OR (95%CI)*
Self-use of T&CM (Ever), N = 322	**192**	**130**		
Yes	142 (63.7)	81 (36.3)	1.72 (1.06 - 2.77)	2.01 (1.16 – 3.44)
No	50 (50.5)	49 (49.5)	1.00	1.00
Wants to know more about T&CM, N = 291	**185**	**106**		
Yes	179 (73.1)	66 (26.9)	18.08 (7.32 – 44.6)	19.68 (7.58 – 51.13)
No	6 (13.0)	40 (87.0)	1.00	1.00
Integrate practice of T&CM into mainstream biomedicine, N = 286	**175**	**111**		
Yes	168 (88.9)	21 (11.1)	102.9 (42.11 –251.2)	179.3 (57.4 – 560.1)
No	7 (7.2)	90 (92.8)	1.00	1.00
Willingness to refer to T&CM practitioners N = 271	**150**	**121**		
Yes	69 (90.8)	7 (9.2)	13.87 (6.06 – 31.75)	12.70 (5.12 – 31.46)
No	81 (41.5)	114 (58.5)	1.00	1.00
Willingness to discuss T&CM with patients N = 293	**176**	**117**		
Yes	166 (76.7)	45 (21.3)	26.56 (12.69 – 55.61)	25.72 (11.75 – 56.3)
No	10 (12.2)	72 (87.8)	1.00	1.00
There are no estimable benefits of T&CM N = 271	**161**	**110**		
Yes	26 (30.6)	59 (69.4)	0.17 (0.09 – 0.29)	0.13 (0.07 – 0.25)
No	135 (72.6)	51 (27.4)	1.00	1.00
Encouraging use of T&CM at biomedical facilities poses threat to public health N = 262	**148**	**109**		
Yes	46 (40.0)	69 (60.0)	0.26 (0.16 – 0.44)	0.17 (0.09 – 0.33)
No	102 (71.8)	40 (28.2)	1.00	1.00

*Adjusted for: age, sex, region of origin of students and year of study at medical school.

Incorporating traditional and complementary practices in the national health system

Two thirds (66.9%; 218/326) of participants endorsed integrating principles and practices of T&CM into the national health system. However, participants in third year were less likely to desire incorporation of T&CM practices into the mainstream national health system (OR=0.40;95%CI:0.20 – 0.80) as compared to the second year students who had not yet had clinical exposure during their training in the medical school. This association was not statistically significant for the fourth and fifth year medical students. Age and gender were not statistically significantly associated with the disposition to integrate T&CM into the mainstream national health system (Table 4).

Table 4: Disposition to integrate traditional and complementary (T&CM) medicine practice into mainstream medicine

Demographic variables	Integrate T&CM into the national health system		Odds Ratios	
	Yes, N	No, N	Crude odds Ratio (OR) (95%CI)	Adjusted Odds Ratio (AOR) ** (95%CI)
Sex				
N = 328	**219**	**109**		
Male	149 (63.9)	84 (36.1)	1.00	1.00
Female	70 (73.7)	25 (26.3)	1.58 (0.93 - 2.68)	1.67 (0.92 - 3.03)
Age group (Years)				
N = 314	**209**	**105**		
19 – 22	74 (64.4)	41 (35.6)	1.00	1.00
23 – 26	105 (67.7)	50 (32.3)	1.16 (0.70 - 1.94)	1.68 (0.82 - 3.44)
≥ 27	30 (68.2)	14 (31.8)	1.19 (0.57 - 2.49)	1.61 (0.68 - 3.84)
Years of study				
N = 326	**218**	**108**		
2nd	71 (75.5)	23 (24.5)	1.00	1.00
3rd	51 (54.8)	42 (45.2)	**0.39 (0.21 - 0.73)**	**0.40 (0.20 - 0.80)**
4th	53 (72.6)	20 (27.4)	0.86 (0.43 - 1.72)	0.77 (0.31 - 1.89)
5th	43 (65.2)	23 (34.8)	0.61 (0.30 - 1.21)	0.45 (0.18 - 1.10)
Region of origin of student				
N = 322	**215**	**107**		
Northern	14 (58.3)	10 (41.7)	1.00	1.00

North Eastern	6 (54.6)	5 (45.4)	0.85 (0.20 - 3.61)	0.95 (0.22 - 4.13)
Eastern	39 (66.1)	20 (33.9)	1.39 (0.53 - 3.69)	1.42 (0.51 - 3.92)
West Nile	10 (83.3)	2 (16.7)	3.57 (0.64 - 19.97)	3.05 (0.50 - 8.40)
Mid-Western	16 (64.0)	9 (36.0)	1.27 (0.40 - 4.02)	1.42 (0.43 - 4.67)
South Western	23 (62.2)	14 (37.8)	1.17 (0.41 - 3.35)	1.34 (0.44 - 4.07)
Central	105 (71.4)	42 (28.6)	1.79 (0.74 - 4.33)	2.05 (0.81 - 5.16)
Missing	2 (28.6)	5 (71.4)	0.29 (0.05 - 1.78)	0.38 (0.06 - 2.61)

**Adjusted for the demographic factors included in the table.

Discussion

The main aims of this study were to quantify the disposition to include principles of T&CM into medical school curricula and to determine factors that are associated with the disposition among preclinical and clinical year students at the oldest medical school in Uganda. In addition, we also sought to determine attitudes of the students towards integration of T&CM into mainstream national health services. We found that two thirds of medical students considered it necessary to include T&CM principles into the medical school curricula in Uganda. More than half of participants also reported self-use of T&CM, wanted to learn more about T&CM as well as wished to have T&CM integrated into the national health system of Uganda. However, up to 60% (161/271) of the students also noted that the issue of T&CM needs to be handled with caution because it is difficult to estimate the benefits and harms that may arise from using T&CM. These findings support the need to conduct similar studies with government regulatory bodies including the Medical and Dental Practitioners Council and ministry of health officials to determine their disposition in order to inform the process of curricula review and the integration of T&CM and biomedicine into one national health system. Our qualitative study that preceded this study revealed some ethical and operational challenges that need to be addressed before and during integration[24]. Drawing from both this study and our earlier qualitative study with medical students, their faculty and the traditional health practitioners, there is a clear need to equip the medical students and healthcare professionals with critical knowledge and approaches to T&CM practice in order to enable them communicate better with their patients who often use T&CM modalities. Health sciences students in South Africa, Sierra Leone, the Middle East and Asia have similarly reported the importance of learning about T&CM in their medical practices[25-29]. Empowering healthcare professionals with the tools to talk to their patients and find/use evidence-based resources could potentially minimize patients'

delay in health seeking due to fear of being rebuked by the healthcare professionals for using T&CMs.

Medical students do not need to be trained to practice T&CM, but rather to know about and become aware of the paradigm from which T&CM practitioners do their healing. Biomedical and traditional health practitioners who currently have inadequate knowledge of what each other do could then work side by side in an integrated national health system with clear regulations to guide and control practices. Hitherto, there are two parallel health systems in Uganda: the dominant biomedical national health system and the traditional health practices that are often sought covertly. Having two parallel health systems potentially contributes to delay in seeking medical care if patients choose to seek help alternately rather than concurrently. For example, a study among breast cancer patients in Indonesia showed that use of traditional medicine before conventional medicine health seeking and after cancer diagnoses led to delay and advanced stage cancers at diagnoses and missing of treatment schedules respectively[30]. Similarly, in Malaysia, cancer patients who visited traditional health practitioners (THP) before seeking care at medical facilities experienced increased time to diagnosis and hence advanced stage cancers at diagnoses[31]. To avoid the tendency for delay in health seeking, it could be prudent for states, especially those in the low-income countries where patients seek care in series/alternately to adopt the strategies advocated and outlined by WHO regarding the integration of T&CM into their national health systems[8 32]. In this way, patients could find both systems of care within the same vicinity. An important step in the integration of T&CM with conventional medicine is training of medical students on aspects of T&CM, and training of the T&CM practitioners on critical aspects of biomedicine, including infection control approaches, immunization, how to avoid risk factors for diseases, and adopting healthy behaviors. Medical students need principles of T&CM in their curricula to

improve their awareness about T&CM, enable them communicate competently with their patients regarding T&CM use, and to enable them refer patients when appropriate to THPs[33].

In this study, the medical students who considered that objectively estimating the benefits and harms from T&CM was difficult, and those who thought that endorsing use of T&CM would pose threat to public health were more cautious regarding intention to include T&CM into medical school curricula. To this end, healthcare professionals need to engage more vigorously in researches involving T&CM in order to accumulate evidence for effectiveness and safety of T&CM for guiding informed consents and health care choices[13]. Medical students need to be taught T&CM and encouraged to engage in research involving T&CM in order to reduce gaps in knowledge that physicians have on common T&CMs[34]. Studies have shown that many physicians not only lack knowledge on T&CM, but also hold the potentially erroneous beliefs that T&CM are not proven to be effective, and can be harmful to humans. In Jordan, up to 80% and 70% of Jordanian physicians reported that T&CM are not evidence-based and could cause harm to patients respectively[35]. The belief among physicians that T&CM is "not evidence-based" treatment was also reported in a nationwide survey in Japan, where nearly 82% of 751 surveyed oncologists believed that T&CM was ineffective because of lack of reliable scientific evidence[36]. Even in the US where a number of medical schools have already included aspects of T&CM in their integrative medicine curricula, a survey of 705 physicians in Colorado, showed that only few physicians thought they had adequate knowledge about T&CM to allow them provide factual information to their patients for use or non-use. The majority of the surveyed physicians reported that they needed to learn more about T&CM in order to competently address patients' concerns [37]. It is therefore critical to include T&CM into medical school curricula.

Limitations

This study has some limitations that potentially restrict interpretations and generalization of the findings; only one medical school was included in the study. The uniqueness of Makerere University School of Medicine including its position as the oldest and most famous medical school in the region could limit utility of our findings. However, the national nature and universal mix of students and faculty at this university could mean that opinion and experiences from all over the country and perhaps region are represented and therefore increase the likelihood that findings from other medical schools could be similar to our findings. This argument is supported by our data which showed that the disposition to include principles of T&CM into medical school curricula and to integrate T&CM with the national health system was not influenced by the region of Uganda where the students originated. Second, the tool for data collection was not validated, and this could import some constructs and reliability bias. Pilot testing was done to ameliorate these bias. However, future studies could develop and validate a culture and context sensitive tool similar to the IMAQ (Integrative Medicine Attitude Questionnaire) [38] for use in the low-income countries. Other potential limitations are volunteer bias and the male dominance among the study participants. However, this is unlikely to have influenced our findings because sex was not statistically significantly associated with the disposition to include T&CM into the medical school curricula. In addition, most medical schools in Uganda have a male predominance. Therefore, our sample could be representative of the general population of medical schools in Uganda, and generalizability of findings could be appropriate. Again, volunteer bias is unlikely to have played a role in this study because participation was generally high with 99.5% participation rate (393 of 395 invited students participated). There were no students who declined to participate.

Conclusion

Medical students support inclusion of traditional and complementary medicine (T&CM) principles into medical school curriculum and the national health system in Uganda. Including T&CM in medical school curricula increases awareness and knowledge of the future clinicians on T&CM, potentially fosters cooperation and collaboration between T&CM practitioners and biomedicine, and helps the students understand better the paradigm from which traditional health practitioners treat their patients[16 17]. Third and fifth year medical students were less enthusiastic regarding inclusion of T&CM into medical school curricula mainly because of challenges involved in estimating benefits and harms from T&CM, and the potential harms to individual and public health that T&CM pose [24].

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Contributors Study concept and design: ADM, CI and GT; acquisition of data: ADM; analysis of data: ADM and SV; interpretation of data: all authors; drafting of the manuscript: ADM; critical revision of the manuscript for important intellectual content: all authors; statistical expertise: ADM; study supervision: ADM, CI and COG. Final approval of the submitted version of the manuscript and where to submit: all authors.

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Competing Interests The authors declare that they have no competing interests.

Patient consent Not applicable.

Ethical approval This study protocol was approved by the Makerere University School of Social Sciences Research and Ethics Committee (MakSSSREC), number **MAKSS REC01.17.013**. Authority to interact with and interview medical students was obtained from the Principal, College of Health Sciences, Makerere University. Each study participant was provided detail information about the study including study purpose and procedures. All participants provided written informed consents before participating in the study. Data from the study has been anonymized and protected from reach of any unauthorized persons to uphold privacy and confidentiality. Participants received a token of $2.50 as transport refund.

Disclaimers None.

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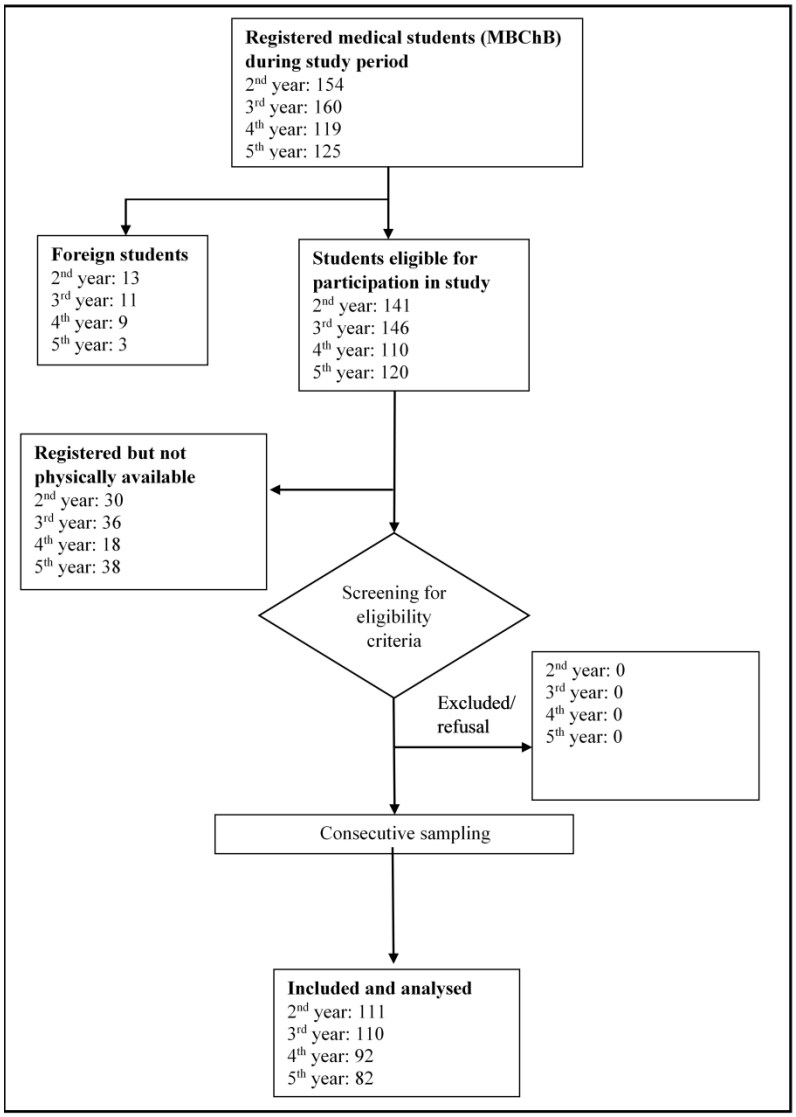
Figure 1: Study Recruitment flow



997x1510mm (96 x 96 DPI)

STROBE 2007 (v4) Statement—Checklist of items included: Integration of Traditional and Complementary Medicine into medical school curricula: A survey among medical students in Makerere University, Uganda

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4 & 5
Objectives	3	State specific objectives, including any pre-specified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	8
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	8
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	9 & 10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Not applicable
Bias	9	Describe any efforts to address potential sources of bias	Not applicable
Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10
		(*b*) Describe any methods used to examine subgroups and interactions	Not applicable
		(*c*) Explain how missing data were addressed	Not applicable

		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	Not applicable
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	Supplementary material 1
Descriptive data	14*	(a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders	11
		(b) Indicate number of participants with missing data for each variable of interest	Not applicable
Outcome data	15*	Report numbers of outcome events or summary measures	Not applicable
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included	12, 13, 14 & 15
		(*b*) Report category boundaries when continuous variables were categorized	Not applicable
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—e.g. analyses of subgroups and interactions, and sensitivity analyses	Not applicable
Discussion			
Key results	18	Summarise key results with reference to study objectives	17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	19 & 20
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20
Generalisability	21	Discuss the generalisability (external validity) of the study results	20
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	21

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

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Integration of Traditional and Complementary Medicine into medical school curricula: A survey among medical students in Makerere University, Uganda

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Integration of Traditional and Complementary Medicine into medical school curricula: A survey among medical students in Makerere University, Uganda

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Abstract

Objective: To describe the disposition and sociodemographic characteristics of medical students associated with inclusion of traditional and complementary medicine in medical school curricula in Uganda.

Design: A cross-sectional study conducted during May 2017. A pretested questionnaire was used to collect data. Disposition to include principles of traditional and complementary medicine into medical school curricula was determined as proportion, and associated factors determined through multivariate logistic regression.

Participants and setting: Medical students in their 2nd to 5th years at the College of Health Sciences, Makerere University, Uganda. Makerere University is the oldest public university in the East African region.

Results: 393 of 395 participants responded. About 60% (192/325) of participants recommended inclusion of traditional and complementary medicine principles into medical school curricula in Uganda. The disposition to include traditional and complementary medicine into medical school curricula was not associated with sex, age group, nor region of origin of the students. However, compared to the 2nd year students, the 3rd (OR=0.34; 95%CI: 0.17-0.66) and 5th (OR=0.39; 95%CI: 0.16-0.93) year students were significantly less likely to recommend inclusion of traditional and complementary medicine into the medical school curricula. Participants who hold positive attributes and believe in effectiveness of traditional and complementary medicine were statistically significantly more likely to recommend inclusion into the medical school curricula in Uganda.

Conclusions: Inclusion of principles of traditional and complementary medicine into medical school curricula to increase knowledge, inform practice and research, and moderate attitudes of physicians towards traditional medicine practice is acceptable by medical students at

Makerere University. These findings can inform review of medical schools' curricula in Uganda.

Key words: Traditional and complementary medicine, Medical school curricula, Medical students, Makerere University, Uganda.

Strengths and limitations of this study

- To our knowledge, this is the first study to systematically evaluate the disposition of medical students and their sociodemographic factors associated with intention to include principles of traditional and complementary medicine into medical school curricula in Uganda.
- More than 70% (395/558) of registered medical students enthusiastically participated in the study; no eligible participants available at time of study declined participation.
- The study involved students from only one public medical school; so findings may be systematically different from studies conducted in the newer medical schools.
- The cross sectional nature of the study limits attributing the difference in dispositions to include traditional and complementary medicine by year of study to the effect of time in training and interactions in the medical school.

Background

Worldwide, a significant proportion of patients use traditional and complementary medicines (T&CM) in the treatment of various illnesses. For example, a systematic review of 26 studies done in 13 countries showed that 7% – 64% of cancer patients (average use 31%) use T&CM at some point during their illness[1]. In sub Saharan Africa, a recent systematic review showed a high use of T&CM alone or in combination with conventional medicine. Most of the users were likely to be of low socioeconomic status and low educational attainment. The review also showed that most of the users (55.8% - 100%) do not disclose use to healthcare professionals[2]. In Uganda, T&CM practice is common across a range of illnesses including diabetes, hypertension and cancers. People use T&CM for various reasons including beliefs in intrinsic efficacy, long history of use, and perceived barriers to biomedical care[3-6]. It is likely that T&CM use and traditional healing practices will continue side by side with biomedicine for the foreseeable future[7]. In addition, the World Health Organization (WHO) supports the incorporation of T&CM into national health systems and has developed a traditional medicine strategy (2014 – 2023) that stipulates the importance of and how to integrate traditional medicine into the national biomedical health system. The WHO strategies acknowledge that T&CM of proven quality, safety, and efficacy essentially contributes to improving access to care by all people in need[8].

The World Health Organization (WHO) [8 9] has described traditional medicine as: ". . . the sum total of the knowledge, skill, and practices based on the theories, beliefs, and experiences traditional to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness". On the other hand, WHO [8 9] describes complementary medicine as: ". . . a broad set of healthcare practices that are not part of that country's own tradition or conventional medicine

and are not fully integrated into the dominant health-care system." In this study, Traditional and Complementary Medicine (T&CM) was described as any practices that is not part of conventional medicine (biomedicine), whose philosophical underpinnings are beliefs, customs and experiences traditional to the people concern, and whose aims are maintenance of health, prevention of ill health, determination of causes of ill health and the treatment of diseases and ill health including physical, social and mental disorders. The foregoing descriptions of T&CM do not include issues of evidence for effectiveness or harm of the practices. Evidence based use of T&CM in combinations with conventional medicine fall in the realm of integrative medicine. In the high-income countries, particularly Canada and USA, a tight working relationship has developed between conventional medicine and traditional medicine practices. This has led to the emergence of a hybrid system of healthcare dispensation, the integrative medicine, which brings together the two practices under one roof. Integrative medicine has variously been defined as: ". . . a sound combination of safe and effective ancient traditional medicine or complementary and alternative medicine, and state-of-the-art conventional medicine [10]." And, ". . . an approach to the practice of medicine that makes use of the best available evidence taking into account the whole person (body, mind, and spirit), including all aspects of lifestyle. It emphasizes the therapeutic relationship and makes use of both conventional and complementary/alternative approaches [11]." In a bid to harmonize integrative medicine practices and derive maximum benefits from both conventional and traditional medicine practices, while minimizing harms, a consortium of 57 academic health institutions and health systems in North America have formed an alliance, The Consortium of Academic Health Centers for Integrative Medicine (CAHCIM) to oversee and regulate as well as uphold standards of care and safety. The Consortium has defined integrative medicine as follows: "the practice of medicine that reaffirms the importance of the relationship between practitioner and patient, focuses on the whole person, is informed by evidence, and makes use of all appropriate

therapeutic approaches, healthcare professionals and disciplines to achieve optimal health and healing [12].” There is a clear common philosophical strand that spans through the above definitions of integrative medicine, and traditional medicine; the need to respect the right of the patients and to provide safe, effective and accessible healthcare to the human population.

Regardless of whether patients choose to use T&CM in parallel, interchangeably or in combination with biomedicine, physicians ought to uphold the ethical principles of beneficence and safeguard public welfare by among others providing appropriate management based on best available evidence[13]. The duty to prevent harm and protect patients’ welfare demands that healthcare professionals (HCPs) have access to information regarding evidence on efficacious and effective T&CM. Physicians are also obliged to know the harmful effects of T&CM in order to be able to provide appropriate guidance to their patients and the public regarding their healthcare choices[14]. Failure of HCPs to advise patients against potentially harmful T&CM is deemed unethical because such patients could get harmed by using the T&CMs[15]. Including aspects of T&CM into medical school curricula increases awareness and knowledge of the future clinicians on T&CM, enables the students to understand better the paradigm from which traditional health practitioners (THP) treat their patients, and potentially fosters cooperation and collaboration between T&CM practitioners and conventional medicine[16 17]. In addition, there is evidence that general knowledge regarding the theories and fundamentals in T&CM practices could help physicians in guiding patients about their health choices[18]. To that extent, physicians ought to know about T&CM so they can guide their patients appropriately and ensure safety of use of T&CM alone or in combinations with conventional medicine. This requires that medical schools include principles of T&CM into their curricula, so the medical students could learn about T&CM principles including why T&CM matters, how to talk about it with patients, how/where to access it, how they work, and potential side effects, without

taking on the expectation of becoming experts in its delivery. The medical schools need not appear to be training the medical students to become T&CM practitioners, a notion that could make the T&CM practitioners feel threatened in their trade and object genuine integration of biomedicine with T&CM. However, there are limited data on the proportions of medical schools in sub Saharan Africa that teach aspects of T&CM to their medical students. Similarly, there is limited awareness of the disposition of medical students towards the integration of T&CM into medical school curricula in Uganda and most sub Saharan Africa. Therefore, there is need to determine upfront the proportion and characteristics of medical students who endorse the inclusion of T&CM into the curricula of medical schools. The aim of this study was therefore to understand the attitudes and perceptions of medical students at Makerere University College of Health Sciences (MakCHS) regarding the inclusion of principles of T&CM into the medical school curricula. We also aimed to establish the sociodemographic characteristics of the students who are disposed to inclusion of T&CM into the medical school curricula. These findings can inform policies on the integration of T&CM and biomedical practices in Uganda so that the medical students and physicians (i) become familiar with the epidemiology of use and best available evidence on T&CM (where to find it, how to interpret it), and (ii) know how to discuss issues of T&CM with patients in an open and non-judgmental way.

Methods

Study design and setting

We conducted a cross sectional survey at the School of Medicine, Makerere University College of Health Science (MakCHS). The School of Medicine was started in 1923. It is the oldest medical school in Uganda and admits about 80 - 100 first year medical students every year. The school has been keen to adopt innovative approaches to training and learning including problem based learning (PBL) and community based education and service (COBES) to improve learning experience and produce doctors with knowledge and skills that are relevant to demands of the societies they serve[19-22].

Study population and period

Participants to this study included all registered Ugandan male and female medical students in the second, third, fourth and fifth years pursuing the degree of bachelor of medicine and bachelor of surgery (MBChB). The MBChB program involves five years of theoretical and practical training before the successful candidates enrol for a supervised internship practice of one year. First year students were excluded from this study on assumption that their views might be very similar to views of the general community, and lack the insight that medical students typically have as product of their training and experiences in the training institution. The curriculum of the students involves rotation and training on the wards during the fourth and fifth years of study. Foreign students (n=36) were excluded because their concepts of T&CM could be influenced by the status of practices in their home countries. Data was collected in May 2017, during the week immediately after the end of year university examinations when students were generally available on campus and awaiting the start of the recess semester.

Sampling and recruitment of participants

The first author and three research assistants (RA) met with the president of the medical students' association (Makerere University Medical Students' Association – MUMSA), and discussed the objectives and procedures for the study. Thereafter, the president and the RAs met with the class representatives of the 2nd, 3rd, 4th and 5th year students, and agreed on the dates and time for interviews for each class. The students were met separately by their year of study in designated lecture theatres following mobilization by the president and their class representatives. The fifth year students were the first to be interviewed because they would soon leave the University for Internship. Subsequently, the fourth, third and second year students were met, each group on different days. The research assistants provided explanations about purpose and objectives of the study to all eligible participants before enrolment. Thereafter, prospective participants were given the study information sheet with detail information on the study including objectives, inclusion criteria, consent procedures and rationale for selection of the specific category of participants. Every registered student present in the meeting who met eligibility criteria was enrolled consecutively into the study (Figure 1). Participants were given opportunities to ask questions regarding the study. Individual informed consents were sought from each participant before administration of the questionnaire. No prospective participants declined participation in the study. Participants self-completed the questionnaires and returned them to the RAs through their representatives. Participants who wished to complete their questionnaires from their halls of residents were allowed to return the completed questionnaires the following day and deposit with the MUMSA president. All participants returned their completed questionnaires.

Sample size estimation

Sample size estimation was based on the Kish Leslie formula[23]. The estimated sample size was 383 students. An a priori decision was made to include all eligible students in 2nd to 5th years of study. 395 students were included in the study.

Data collection

The authors did not find published validated tools used for this kind of study in the low-income countries, particularly sub Saharan Africa. The tool (supplementary file 1) for this study was therefore developed based on experiences of the investigators and literature regarding traditional medicine, physicians' knowledge of T&CM, and the inclusion of T&CM into medical school curricula. The tool was piloted with ten medical students from third year; these students were subsequently excluded from participation in the main data collection. The pilot data were reviewed, and the tool was refined before use in the main data collection. The first author (ADM) supervised the research assistants during data collection. The students self-administered the questionnaires after provision of written informed consents. Participants were asked about self-use of T&CM, and their disposition towards including T&CM principles into medical school curricula so medical students could understand the basic tenets of T&CM and know how to talk about them with their patients. Attitudes towards effectiveness, safety and usefulness of T&CM were assessed by asking participants questions about T&CM values and utility. For example, participants were asked about self-use and desire for more knowledge on T&CM, willingness to discuss, and reactions to issues on T&CM during medical consultations once they have qualified as doctors, whether or not they consider T&CM safe, and perceived value of integrating T&CM with the mainstream national health system.

Data management and analysis

Data was entered on Epi Data, version 3.1 (Epidata software, Odense, Denmark). A biostatistician randomly selected 10% of the questionnaires, and independently entered them as part of quality check. There were no significant data entry errors found in the dataset. The full dataset was exported into STATA I/C, version 13.1 (StataCorp LP, College Station, TX, USA). Analyses included descriptive statistics and determinations of associations between explanatory demographic variables and outcome variables including disposition to include principles of T&CM into medical school curricula. The secondary outcome measure was attitudes towards incorporating T&CM into mainstream biomedicine. Chi-square tests were used to determine associations between the explanatory variables and outcome variables. Unconditional logistic regression models were used to determine magnitudes of associations between explanatory and outcome variables. Odds ratios have been reported with accompanying two-tail 95% confidence intervals.

Patient and public involvement

There was no direct involvement of patients and the public in this study. However, the motivation for this study was the limited evidence to guide and inform the formulation and implementation of a bill "The Indigenous and Complementary Medicine Bill 2015" in the Parliament of the Republic of Uganda. Findings from this study was shared with members of the Parliamentary Committee on Health on the 23rd May 2018 during a session to gather evidence to formulate the Bill into a law.

Results

Study participants

Of 395 participants invited, 393 (99.5%) responded. The distribution of students who responded by year of study were relatively comparable: second year (25.8%; n=98), third year (28.9%; n=110), fourth year (23.9%; n=91) and fifth years (21.3%; n=81). Majority of participants were male (70.5%; n=277) and aged 23 – 26 years (50.5%, n=277) (Table 1).

Table 1: Demographic characteristics by year of study

	Year of study N (%)				
Variable	**2nd**	**3rd**	**4th**	**5th**	**Total**
Age group (Years)	98	110	91	81	380
19 - 22	77 (56.2)	51(37.2)	6 (4.4)	3 (2.2)	137
23 – 26	14 (7.3)	42 (21.9)	68 (35.4)	68 (35.4)	192
≥ 27	7 (13.7)	17 (33.3)	17 (33.3)	10 (19.6)	51
Missing	13	0	1	3	17
Gender	104	109	92	82	393
Male	71 (25.6)	76 (27.4)	70 (25.3)	60 (21.7)	277
Female	37 (31.9)	35 (30.1)	22 (19.0)	22 (19.0)	116
Missing	7	1	0	2	10
Region of origin	111	110	92	84	387
Northern	6 (23.1)	5 (19.2)	9 (34.6)	6 (23.1)	26
North Eastern	2 (16.7)	2 (16.7)	4 (33.3)	4 (33.3)	12
Eastern	16 (21.9)	22 (30.1)	22 (30.1)	13 (17.8)	73
West Nile	4 (28.6)	2 (14.3)	6 (42.9)	2 (14.2)	14
Mid-Western	9 (27.3)	12 (36.4)	7 (21.2)	5 (15.2)	33
South Western	19 (36.5)	19 (36.5)	6 (11.5)	8 (15.4)	52
Central	48 (28.7)	43 (25.8)	35 (21.0)	41 (24.6)	167
Missing	0	4	3	3	10

Inclusion of traditional and complementary medicine into medical school curricula

More than half of participants (59.1%; 192/325) wished that theories and principles of T&CM be included in the medical school curricula in Uganda. On adjusting for sex, age and region of origin, the third (OR=0.34;95%CI:0.17 - 0.66) and fifth (OR=0.39;95%CI:0.16 - 0.93) year medical students were statistically significantly less likely to desire the inclusion of T&CM into medical school curricula as compared to the second year medical students. There was no

statistically significant difference in the disposition to include T&CM into the curricula by gender, age groups and region of origin (Table 2).

Table 2: Demographic characteristics and disposition to include traditional and complementary medicine (T&CM) theories and principles into medical school curricula

	Integrate T&CM into the medical school curricula		**Odds Ratios (OR)**	
Demographic variables N (%)	**Yes, N**	**No, N (%)**	**Crude OR (95%CI)**	**Adjusted OR (95%CI)**
Sex, N = 314	**193**	**134**		
Male	138 (58.2)	99 (41.8)	1.00	1.00
Female	55 (61.1)	35 (38.9)	1.13(0.69 - 1.85)	1.07 (0.62 - 1.87)
Age group (Years), N = 322	**187**	**127**		
19 – 22	68 (60.2)	45 (39.8)	1.00	1.00
23 – 26	96 (61.1)	61 (38.9)	1.04 (0.63 - 1.71)	1.55 (0.77 - 3.11)
≥ 27	23 (52.3)	21 (47.7)	0.72 (0.36 - 1.46)	1.07 (0.47 - 2.45)
Years of study, N = 325	**192**	**133**		
2nd	67 (71.3)	27 (28.7)	1.00	1.00
3rd	44 (46.3)	51 (53.7)	**0.35 (0.19 - 0.63)**	**0.34 (0.17 - 0.66)**
4th	45 (63.4)	26 (36.6)	0.70 (0.36 - 1.35)	0.62 (0.26 - 1.43)
5th	36 (55.4)	29 (44.6)	**0.50 (0.26 - 0.97)**	**0.39 (0.16 - 0.93)**
Region of origin of student, N = 325	**189**	**132**		
Northern	15 (62.5)	9 (37.5)	1.00	1.00
North Eastern	5 (45.5)	6 (54.5)	0.48 (0.12 - 1.93)	0.54 (0.12 - 2.37)
Eastern	28 (50.9)	27 (49.1)	0.71(0.28 - 1.85)	0.76 (0.27 - 2.10)
West Nile	6 (75.0)	2 (25.0)	2.00 (0.33 - 11.97)	1.69 (0.25-11.40)
Mid-Western	18 (9.3)	10 (7.3)	1.2 (0.39 - 3.65)	1.33 (0.41-4.28)
South Western	25 (56.8)	19 (43.2)	0.83 (0.31- 2.25)	1.09 (0.37-3.19)
Central	90 (62.5)	54 (37.5)	1.10 (0.46 - 2.63)	1.29 (0.51 - 3.27)
Missing	2 (28.6)	5 (71.4)	0.4 (0.08 - 2.06)	0.35 (0.05 - 2.36)

Adjustment done for demographic factors in the table. Bold face indicates statistically significant findings.

Attitudes and perceived values of traditional and complementary medicines

More than half of participants reported ever using T&CM for various ailments (59.6%; 192/322), while about two thirds (63.9%; 185/291) would want to know more about T&CM. The odds of recommending inclusion of principles of T&CM into the medical school curricula in Uganda was statistically significantly greater among participants who affirmed positive attributes to T&CM compared with participants who did not believe in the effectiveness of T&CM. For example, upon adjusting for age, sex, year of study and region of origin, participants who reported self-use of T&CM (OR=2.01;95%CI:1.16 - 3.44), wanted to know more about T&CM (OR=19.68;95%CI:7.58-51.13), willing to discuss T&CM with patients (OR=25.72;95%CI;11.75 - 56.30) and willing to refer patients to T&CM practitioners (OR=12.70;95%CI:5.12-31.46) were statistically significantly more likely to recommend integration of T&CM principles into medical school curricula compared to those who never used T&CM, never wanted to know more about T&CM, not willing to discuss issues of T&CM with their patients, and not in disposition to refer patients to T&CM practitioners once in practice respectively (Table 3). On the other hand, there was consistently lower odds of wishing to include T&CM into medical school curricula by participants who affirmed negative attributes including that "encouraging use of T&CM is detrimental to public health" (OR=0.17;95%CI:0.09 – 0.33) and "there is no estimable benefits of using T&CM" (0OR=0.13;95%CI: 0.07-0.25) as compared to participants who thought T&CM was useful to the population and has definite health benefits respectively (Table 3).

Table 3: Disposition to traditional and complementary medicines (T&CM)

Explanatory Variables N (%)	Integrate T&CM in the medical school curricula		Odds Ratios (OR)	
	Yes, N	No, N	Crude OR (95%CI)	Adjusted OR (95%CI)*
Self-use of T&CM (Ever), N = 322	**192**	**130**		
Yes	142 (63.7)	81 (36.3)	1.72 (1.06 - 2.77)	2.01 (1.16 – 3.44)
No	50 (50.5)	49 (49.5)	1.00	1.00
Wants to know more about T&CM, N = 291	**185**	**106**		
Yes	179 (73.1)	66 (26.9)	18.08 (7.32 – 44.6)	19.68 (7.58 – 51.13)
No	6 (13.0)	40 (87.0)	1.00	1.00
Integrate practice of T&CM into mainstream biomedicine, N = 286	**175**	**111**		
Yes	168 (88.9)	21 (11.1)	102.9 (42.11 –251.2)	179.3 (57.4 – 560.1)
No	7 (7.2)	90 (92.8)	1.00	1.00
Willingness to refer to T&CM practitioners N = 271	**150**	**121**		
Yes	69 (90.8)	7 (9.2)	13.87 (6.06 – 31.75)	12.70 (5.12 – 31.46)
No	81 (41.5)	114 (58.5)	1.00	1.00
Willingness to discuss T&CM with patients N = 293	**176**	**117**		
Yes	166 (76.7)	45 (21.3)	26.56 (12.69 – 55.61)	25.72 (11.75 – 56.3)
No	10 (12.2)	72 (87.8)	1.00	1.00
There are no estimable benefits of T&CM N = 271	**161**	**110**		
Yes	26 (30.6)	59 (69.4)	0.17 (0.09 – 0.29)	0.13 (0.07 – 0.25)
No	135 (72.6)	51 (27.4)	1.00	1.00
Encouraging use of T&CM at biomedical facilities poses threat to public health N = 262	**148**	**109**		
Yes	46 (40.0)	69 (60.0)	0.26 (0.16 – 0.44)	0.17 (0.09 – 0.33)
No	102 (71.8)	40 (28.2)	1.00	1.00

*Adjusted for: age, sex, region of origin of students and year of study at medical school.

Incorporating traditional and complementary practices in the national health system

Two thirds (66.9%; 218/326) of participants endorsed integrating principles and practices of T&CM into the national health system. However, participants in third year were less likely to desire incorporation of T&CM practices into the mainstream national health system (OR=0.40;95%CI:0.20 – 0.80) as compared to the second year students who had not yet had clinical exposure during their training in the medical school. This association was not statistically significant for the fourth and fifth year medical students. Age and gender were not statistically significantly associated with the disposition to integrate T&CM into the mainstream national health system (Table 4).

Table 4: Disposition to integrate traditional and complementary (T&CM) medicine practice into mainstream medicine

Demographic variables	Integrate T&CM into the national health system		Odds Ratios	
	Yes, N	No, N	Crude odds Ratio (OR) (95%CI)	Adjusted Odds Ratio (AOR) ** (95%CI)
Sex				
N = 328	**219**	**109**		
Male	149 (63.9)	84 (36.1)	1.00	1.00
Female	70 (73.7)	25 (26.3)	1.58 (0.93 - 2.68)	1.67 (0.92 - 3.03)
Age group (Years)				
N = 314	**209**	**105**		
19 – 22	74 (64.4)	41 (35.6)	1.00	1.00
23 – 26	105 (67.7)	50 (32.3)	1.16 (0.70 - 1.94)	1.68 (0.82 - 3.44)
≥ 27	30 (68.2)	14 (31.8)	1.19 (0.57 - 2.49)	1.61 (0.68 - 3.84)
Years of study				
N = 326	**218**	**108**		
2nd	71 (75.5)	23 (24.5)	1.00	1.00
3rd	51 (54.8)	42 (45.2)	**0.39 (0.21 - 0.73)**	**0.40 (0.20 - 0.80)**
4th	53 (72.6)	20 (27.4)	0.86 (0.43 - 1.72)	0.77 (0.31 - 1.89)
5th	43 (65.2)	23 (34.8)	0.61 (0.30 - 1.21)	0.45 (0.18 - 1.10)
Region of origin of student				
N = 322	**215**	**107**		
Northern	14 (58.3)	10 (41.7)	1.00	1.00

North Eastern	6 (54.6)	5 (45.4)	0.85 (0.20 - 3.61)	0.95 (0.22 - 4.13)
Eastern	39 (66.1)	20 (33.9)	1.39 (0.53 - 3.69)	1.42 (0.51 - 3.92)
West Nile	10 (83.3)	2 (16.7)	3.57 (0.64 - 19.97)	3.05 (0.50 - 8.40)
Mid-Western	16 (64.0)	9 (36.0)	1.27 (0.40 - 4.02)	1.42 (0.43 - 4.67)
South Western	23 (62.2)	14 (37.8)	1.17 (0.41 - 3.35)	1.34 (0.44 - 4.07)
Central	105 (71.4)	42 (28.6)	1.79 (0.74 - 4.33)	2.05 (0.81 - 5.16)
Missing	2 (28.6)	5 (71.4)	0.29 (0.05 - 1.78)	0.38 (0.06 - 2.61)

**Adjusted for the demographic factors included in the table.

Discussion

The main aims of this study were to quantify the disposition to include principles of T&CM into medical school curricula and to determine factors that are associated with the disposition among preclinical and clinical year students at the oldest medical school in Uganda. In addition, we also sought to determine attitudes of the students towards integration of T&CM into mainstream national health services. We found that two thirds of medical students considered it necessary to include T&CM principles into the medical school curricula in Uganda. More than half of participants also reported self-use of T&CM, wanted to learn more about T&CM as well as wished to have T&CM integrated into the national health system of Uganda. However, up to 60% (161/271) of the students also noted that the issue of T&CM needs to be handled with caution because it is difficult to estimate the benefits and harms that may arise from using T&CM. These findings support the need to conduct similar studies with government regulatory bodies including the Medical and Dental Practitioners Council and ministry of health officials to determine their disposition in order to inform the process of curricula review and the integration of T&CM and biomedicine into one national health system. Our qualitative study that preceded this study revealed some ethical and operational challenges that need to be addressed before and during integration[24]. Drawing from both this study and our earlier qualitative study with medical students, their faculty and the traditional health practitioners, there is a clear need to equip the medical students and healthcare professionals with critical knowledge and approaches to T&CM practice in order to enable them communicate better with their patients who often use T&CM modalities. Health sciences students in South Africa, Sierra Leone, the Middle East and Asia have similarly reported the importance of learning about T&CM in their medical practices[25-29]. Empowering healthcare professionals with the tools to talk to their patients and find/use evidence-based resources could potentially minimize patients'

delay in health seeking due to fear of being rebuked by the healthcare professionals for using T&CMs.

Medical students do not need to be trained to practice T&CM, but rather to know about and become aware of the paradigm from which T&CM practitioners do their healing. Biomedical and traditional health practitioners who currently have inadequate knowledge of what each other do could then work side by side in an integrated national health system with clear regulations to guide and control practices. Hitherto, there are two parallel health systems in Uganda: the dominant biomedical national health system and the traditional health practices that are often sought covertly. Having two parallel health systems potentially contributes to delay in seeking medical care if patients choose to seek help alternately rather than concurrently. For example, a study among breast cancer patients in Indonesia showed that use of traditional medicine before conventional medicine health seeking and after cancer diagnoses led to delay and advanced stage cancers at diagnoses and missing of treatment schedules respectively[30]. Similarly, in Malaysia, cancer patients who visited traditional health practitioners (THP) before seeking care at medical facilities experienced increased time to diagnosis and hence advanced stage cancers at diagnoses[31]. To avoid the tendency for delay in health seeking, it could be prudent for states, especially those in the low-income countries where patients seek care in series/alternately to adopt the strategies advocated and outlined by WHO regarding the integration of T&CM into their national health systems[8 32]. In this way, patients could find both systems of care within the same vicinity. An important step in the integration of T&CM with conventional medicine is training of medical students on aspects of T&CM, and training of the T&CM practitioners on critical aspects of biomedicine, including infection control approaches, immunization, how to avoid risk factors for diseases, and adopting healthy behaviors. Medical students need principles of T&CM in their curricula to

improve their awareness about T&CM, enable them communicate competently with their patients regarding T&CM use, and to enable them refer patients when appropriate to THPs[33].

In this study, the medical students who considered that objectively estimating the benefits and harms from T&CM was difficult, and those who thought that endorsing use of T&CM would pose threat to public health were more cautious regarding intention to include T&CM into medical school curricula. To this end, healthcare professionals need to engage more vigorously in researches involving T&CM in order to accumulate evidence for effectiveness and safety of T&CM for guiding informed consents and health care choices[13]. Medical students need to be taught T&CM and encouraged to engage in research involving T&CM in order to reduce gaps in knowledge that physicians have on common T&CMs[34]. Studies have shown that many physicians not only lack knowledge on T&CM, but also hold the potentially erroneous beliefs that T&CM are not proven to be effective, and can be harmful to humans. In Jordan, up to 80% and 70% of Jordanian physicians reported that T&CM are not evidence-based and could cause harm to patients respectively[35]. The belief among physicians that T&CM is "not evidence-based" treatment was also reported in a nationwide survey in Japan, where nearly 82% of 751 surveyed oncologists believed that T&CM was ineffective because of lack of reliable scientific evidence[36]. Even in the US where a number of medical schools have already included aspects of T&CM in their integrative medicine curricula, a survey of 705 physicians in Colorado, showed that only few physicians thought they had adequate knowledge about T&CM to allow them provide factual information to their patients for use or non-use. The majority of the surveyed physicians reported that they needed to learn more about T&CM in order to competently address patients' concerns [37]. It is therefore critical to include T&CM into medical school curricula.

Limitations

This study has some limitations that potentially restrict interpretations and generalization of the findings; only one medical school was included in the study. The uniqueness of Makerere University School of Medicine including its position as the oldest and most famous medical school in the region could limit utility of our findings. However, the national nature and universal mix of students and faculty at this university could mean that opinion and experiences from all over the country and perhaps region are represented and therefore increase the likelihood that findings from other medical schools could be similar to our findings. This argument is supported by our data which showed that the disposition to include principles of T&CM into medical school curricula and to integrate T&CM with the national health system was not influenced by the region of Uganda where the students originated. Second, the tool for data collection was not validated, and this could import some constructs and reliability bias. Pilot testing was done to ameliorate these bias. However, future studies could develop and validate a culture and context sensitive tool similar to the IMAQ (Integrative Medicine Attitude Questionnaire) [38] for use in the low-income countries. Other potential limitations are volunteer bias and the male dominance among the study participants. However, this is unlikely to have influenced our findings because sex was not statistically significantly associated with the disposition to include T&CM into the medical school curricula. In addition, most medical schools in Uganda have a male predominance. Therefore, our sample could be representative of the general population of medical schools in Uganda, and generalizability of findings could be appropriate. Again, volunteer bias is unlikely to have played a role in this study because participation was generally high with 99.5% participation rate (393 of 395 invited students participated). There were no students who declined to participate.

Conclusion

Medical students support inclusion of traditional and complementary medicine (T&CM) principles into medical school curriculum and the national health system in Uganda. Including T&CM in medical school curricula increases awareness and knowledge of the future clinicians on T&CM, potentially fosters cooperation and collaboration between T&CM practitioners and biomedicine, and helps the students understand better the paradigm from which traditional health practitioners treat their patients[16 17]. Third and fifth year medical students were less enthusiastic regarding inclusion of T&CM into medical school curricula mainly because of challenges involved in estimating benefits and harms from T&CM, and the potential harms to individual and public health that T&CM pose [24].

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Contributors Study concept and design: ADM, CI and GT; acquisition of data: ADM; analysis of data: ADM and SV; interpretation of data: all authors; drafting of the manuscript: ADM; critical revision of the manuscript for important intellectual content: all authors; statistical expertise: ADM; study supervision: ADM, CI and COG. Final approval of the submitted version of the manuscript and where to submit: all authors.

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Competing Interests The authors declare that they have no competing interests.

Patient consent Not applicable.

Ethical approval This study protocol was approved by the Makerere University School of Social Sciences Research and Ethics Committee (MakSSSREC), number **MAKSS REC01.17.013**. Authority to interact with and interview medical students was obtained from the Principal, College of Health Sciences, Makerere University. Each study participant was provided detail information about the study including study purpose and procedures. All participants provided written informed consents before participating in the study. Data from the study has been anonymized and protected from reach of any unauthorized persons to uphold privacy and confidentiality. Participants received a token of $2.50 as transport refund.

Disclaimers None.

Data sharing statement No additional data are available. Study dataset can be made available to third party following reasonable request to corresponding.

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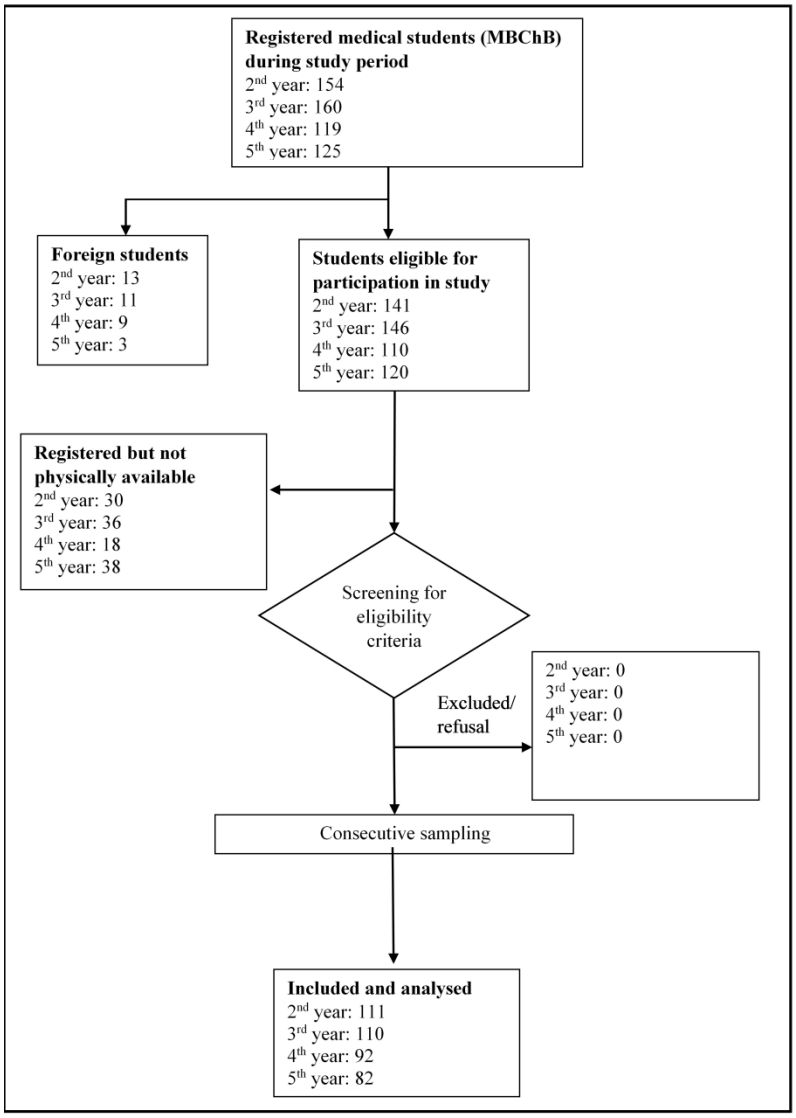
Figure 1: Study Recruitment flow



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INTEGRATING TRADITIONAL AND COMPLEMENTARY MEDICINE INTO MEDICAL SCHOOL CURRICULA IN UGANDA

Specific objective: To determine the proportion and characteristics of students at the College of Health Sciences who endorse inclusion of traditional and complementary medicine education into the medical school curricula in Uganda.

Participants: Medical students at Makerere University College of Health Sciences

Years of study: 2nd, 3rd, 4th and 5th.

Time: The interview is expected to last about 45 minutes.

Informed consent: Purpose of interview will be explained to participants and signed informed consent sought before interview.

Venue: A quiet room or open space to ensure openness and avoid interferences.

Recordings: Participants will fill in questionnaire in presence of investigators/research assistants.

Introduction: In this study we aim to assess the feasibility and acceptability of integration of Traditional and Complementary Medicine principles and practices into the medical school curricula in Uganda. Knowledge from this study can provide guidance on the training needs of physicians and traditional and complementary medicine practitioners which could enhance integration of T&CM with mainstream biomedicine.

Questionnaire for medical students on the use and disposition to include traditional and complementary medicine into medical school curricula in Uganda

Please tick in the appropriate boxes:-

1. Study number: ……..

2. Age: _____ (years)

3. Gender: M ☐ F ☐

4. Currently rotating in department of
   a) Medicine ☐
   b) Surgery ☐
   c) Paediatrics ☐
   d) Obstetrics & Gynaecology ☐
   e) Psychiatry ☐
   f) Other departments ☐
   g) Not in rotation ☐

5. Region of origin in Uganda
   a) Northern ☐
   b) North Eastern ☐
   c) Eastern ☐
   d) West Nile ☐
   e) Mid-western ☐
   f) South western ☐
   g) Central ☐
   f) Other ☐

6. Year of study in medical school
   a) 1st ☐
   b) 2nd ☐
   c) 3rd ☐
   d) 4th ☐
   e) 5th ☐

7. Have you ever used Traditional and Complementary Medicines (T&CM) on yourself?
   a) No ☐
   b) Yes ☐

8. Have you ever recommended use of Traditional and Complementary Medicines (T&CM) in the recent 6 months?

a) No ☐
b) Yes ☐

9. You have adequate knowledge on the safety and efficacy of T&CM.

a) Strongly agree ☐
b) Agree ☐
c) Not certain ☐
d) Disagree ☐
e) Strongly disagree ☐

10. You are up-to-date with the best available evidence on T&CM use.

a) Strongly agree ☐
b) Agree ☐
c) Not certain ☐
d) Disagree ☐
e) Strongly disagree ☐

11. Do you want to learn more about T&CM? a) No ☐
b) Yes ☐

12. What are the sources of information on T&CM use available to you for reference if you need to?

a) Internet-based journals ☐
b) Text books ☐
c) Other healthcare professionals ☐
d) ITCM practitioners ☐
e) Others, please specify: ……

13. How would you respond if a patient asked you about T&CM during consultations?

a) Encourage them to continue use ☐
b) Advise them to stop ☐
c) Neither encourage nor discourage ☐
d) Others, please specify _____

14. The practice of T&CM should be integrated in the mainstream biomedical system in Uganda.

a) Strongly agree ☐
b) Agree ☐
c) Not certain ☐
d) Disagree ☐
e) Strongly disagree ☐

15. The practitioners of T&CM could be allowed to refer patients to the biomedical health facilities.

a) Strongly agree ☐
b) Agree ☐
c) Not certain ☐
d) Disagree ☐
e) Strongly disagree ☐

16. The practitioners of T&CM could be allowed to visit their patients at the biomedical facilities and share their concerns with the healthcare professionals as partners in the care of the patients.

a) Strongly agree ☐
b) Agree ☐
c) Not certain ☐
d) Disagree ☐
e) Strongly disagree ☐

17. When you eventually graduate from medical school, you would be willing to join a T&CM institute to be taught in more details on T&CM theories, principles and practices.

a) Strongly agree ☐
b) Agree ☐
c) Not certain ☐
d) Disagree ☐
e) Strongly disagree ☐

18. When you eventually graduate from medical school, you would consider T&CM practice as: (***Tick all that apply***)

a) Alternative to biomedicine ☐

b) Complementary to biomedicine ☐

c) Not related to biomedicine ☐

d) Not necessary ☐

e) Not evidence-based and dangerous to health ☐

19. When you eventually graduate from medical school, you would be willing to refer some of your patients to T&CM practitioners.

a) Strongly agree ☐

b) Agree ☐

c) Not certain ☐

d) Disagree ☐

e) Strongly disagree ☐

20. When you eventually graduate from medical school, you would be willing to discuss use of T&CM with some of your patients who ask about or are interested in knowing more about T&CM.

a) Strongly agree ☐

b) Agree ☐

c) Not certain ☐

d) Disagree ☐

e) Strongly disagree ☐

21. Encouraging use of T&CM in health facilities promotes the ethical principles of: (***Tick all that apply***).

a) Patients' autonomy ☐

b) Patients' confidentiality ☐

c) Beneficence ☐

d) Non-maleficence ☐

e) Paternalism ☐

e) No biomedical principle is promoted by use of T&CM in health facilities ☐

22. The theories, principles and practice of T&CM should be included in the medical school curricula in Uganda.

a) Strongly agree ☐

b) Agree ☐

c) Not certain ☐

d) Disagree ☐

e) Strongly disagree ☐

NB: Skip to question 25 if you disagree or strongly disagree

23. If you agree or strongly agree to include T&CM in the medical school curricula in Uganda, at what level of training should these theories and principles be included? (***Tick any two that apply***)

a) 1st ☐
b) 2nd ☐
c) 3rd ☐
d) 4th ☐
e) 5th ☐

24. If you agree or strongly agree to include T&CM in the medical school curricula in Uganda, what method of teaching or training should be used to teach T&CM theories and principles be included? (***Tick all that apply***)

a) Lectures ☐
b) Tutorials ☐
c) Practical in skills labs (simulations and demonstrations) ☐
d) Observations and site visits to T&CM practitioners ☐
e) Assign personal readings followed with discussions ☐

25. The curricula of the health training institutions can not include topics on T&CM and there is no need to increase number of training years because T&CM is being given deeper and broader attention in the curricula.

a) Strongly agree ☐
b) Agree ☐
c) Not certain ☐
d) Disagree ☐
e) Strongly disagree ☐

26. If T&CM were to be included in the medical school curricula, the course should be:

a) Elective/optional ☐
b) Compulsory ☐
c) Not certain ☐

27. If T&CM were to be included in the medical school curricula, the course should be:

a) Examinable ☐
b) Audited (students not to be examined on it) ☐
c) Not certain ☐

c) Not certain

28. If T&CM were to be included in the medical school curricula, the course should be taught by:

a) Medical doctors trained in T&CM ☐
b) T&CM practitioners themselves ☐
c) Both medical doctors and T&CM practitioners ☐

29. An independent T&CM institute should be built to train T&CM practitioners on aspects of biomedicine.

a) Strongly agree ☐
b) Agree ☐
c) Not certain ☐
d) Disagree ☐
e) Strongly disagree ☐

30. An independent T&CM institute should be built to train biomedical healthcare professionals as part of in-service training on aspects (theories and principles) of T&CM.

a) Strongly agree ☐
b) Agree ☐
c) Not certain ☐
d) Disagree ☐
e) Strongly disagree ☐

31. There are some benefits from use of T&CM for some illnesses and these benefits can be derived through integration of T&CM with biomedicine.

a) Strongly agree ☐
b) Agree ☐
c) Not certain ☐
d) Disagree ☐
e) Strongly disagree ☐

32. There are no estimable benefits from use of T&CMs and therefore no need to incorporate T&CM into biomedicine practice.

a) Strongly agree ☐
b) Agree ☐
c) Not certain ☐
d) Disagree ☐

e) Strongly disagree ☐

33. Encouraging use of T&CM in health facilities poses threat to the health of the public.

a) Strongly agree ☐

b) Agree ☐

c) Not certain ☐

d) Disagree ☐

e) Strongly disagree ☐

Interviewer:

Name _____

Signature _____

Date _____/_____/_____

Thank you for your cooperation and time.

STROBE 2007 (v4) Statement—Checklist of items included: Integration of Traditional and Complementary Medicine into medical school curricula: A survey among medical students in Makerere University, Uganda

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4 & 5
Objectives	3	State specific objectives, including any pre-specified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	8
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	8
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	9 & 10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Not applicable
Bias	9	Describe any efforts to address potential sources of bias	Not applicable
Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10
		(*b*) Describe any methods used to examine subgroups and interactions	Not applicable
		(*c*) Explain how missing data were addressed	Not applicable

		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Not applicable
		(*e*) Describe any sensitivity analyses	Not applicable
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	Supplementary material 1
Descriptive data	14*	(a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders	11
		(b) Indicate number of participants with missing data for each variable of interest	Not applicable
Outcome data	15*	Report numbers of outcome events or summary measures	Not applicable
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included	12, 13, 14 & 15
		(*b*) Report category boundaries when continuous variables were categorized	Not applicable
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable
Other analyses	17	Report other analyses done—e.g. analyses of subgroups and interactions, and sensitivity analyses	Not applicable
Discussion			
Key results	18	Summarise key results with reference to study objectives	17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	19 & 20
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20
Generalisability	21	Discuss the generalisability (external validity) of the study results	20
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	21

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.