ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCINCE

DEPARTMENT OF NEUROLOGY

KNOWLEDGE, ATTITUDE AND PRACTICE OF RESIDENTS ON BRAIN DEATH IN TIKUR ANBESA SPECIALIZED HOSPITAL: A CROSS SECTIONAL STUDY

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Contents

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Abstract

Background and Aims:

Brain death is defined as irreversible and complete cessation of all brain function including that of the brainstem. The aim of this study was to assess the level of knowledge, attitude and practice of brain-death declaration among residents in Tikur Anbessa specialized hospital in the year 2020.

Methods:

This was a hospital based cross-sectional study in which residents from various field of specialty were included using convenient sampling method. Pretested questionnaire consisting of questions related to knowledge, attitude and performance of brain-death declaration were distributed among residents as per the inclusion criteria to fill. Statistical tools used were mean and standard deviation, and Chi-square test.

Results: A total 123 residents responded to the questionnaire. About 81{68%} correctly defined it as complete cessation of brain activity including brainstem reflexes. Sixty-five {54.6%} of the residents do not agree on brain death to serve to declare legal death .Only 11.7% of the study participants have ever attempted brain death test.

Conclusion: The majority of the residents know about the definition of brain death but most of them have difficulties in identifying the basic physiologic limits which are pre conditions to diagnose brain death. More than half of them don not accept brain death as a legal determinant of death .Practice of brain death testing was poor

LITERATURE REVIEW

In a study done in India to know the level of awareness about transplantation, brain death and cadaveric organ donation in hospital staff in India, About 50% of staff had average to good knowledge regarding different aspects of brain death and organ do nation. However, when each component about brain death was queried separately, 17.3% of the hospital staff thought brain death was a reversible process and 6% were totally unaware of the finality of brain death (1).

In a study done to review empirical studies on the attitudes of healthcare personnel and the general public regarding death criteria and organ donation, it indicates that there is widespread confusion even among medical personnel about why brain death should count as death. In 1986 to 1987, Ettner et al22 surveyed 545 medical professionals (physicians, nurses, hospital administrators, and staff members, in which Seventeen percent agreed that someone who was brain dead was not truly dead until his or her heart stops; 7% said they were unsure(2).

In a study done in Singapore in a tertiary neuroscience referral center with a 12-bed Neuroscience Intensive Care Unit (ICU among physicians of anesthesia, neurology internal medicine and surgery; ,on questions pertaining to the clinicians' knowledge of the brain death certification , 31 respondent (86%) had one or more wrong answers. One-third of respondents reported a lack of confidence in their ability to perform brain death testing correctly without either referring to onsite resources or assistance from doctors in the ICU. Only 7 respondents (19%) were very confident of their ability to perform the brain death tests correctly (3)

In conducting the brainstem tests, 23 respondents (64%) said they would apply a painful stimulus to an area on the face, while the rest would do so on the

hands, feet or an area on the torso. Twenty respondents (56%) would look for the response to painful stimuli on the face. Only 16 respondents (44%) said they would both apply a pain stimulus and assess for the response on the face, while 9 (25%) said they did neither (3)

Twenty-one respondents (58%) said they were confident of being able to distinguish a spinal from a brainstem reflex during brainstem testing. Six respondents (18%) would test for the gag reflex by manipulating the tracheal tube, rather than stimulating the posterior pharynx with a spatula (13 respondents or 38%) or stimulating the trachea with a suction cannula (15 respondents or 44%)(3)

For conduct of the caloric test, only 1 respondent (3%) correctly identified all the steps for performance of this test, which are: using 50 mL of ice-cold water to irrigate the ear canal over at least 1 minute with a 5-minute interval between testing each side. If the testing interval was disregarded, there were 4 (11%) correct responses. If only water temperature and volume were considered, there were13 (36%) correct responses. Thirty-two respondents (91%) said they would not perform the caloric test in the presence of a perforated tympanic membrane, although the national guidelines clearly state that this is not a contraindication (3).

For the conduct of the apnea test, only 5 respondents (14%) were able to describe the test correctly with all the following parameter limits: supplying supplemental oxygen at a flow rate of 6 to 8 L/min, observing for apnea for period of 4 to 9 minutes, and targeting PaCO2 at 50 to 60mm Hg as an adequate stimulus. This number increased to 18 (50%) if the testing parameters were relaxed to include oxygen at any flow rate ε 6 L/min, an apneic interval of 4 to 9 minutes, and a target PaCO2 of 50 to 65 mm Hg(3).

The respondents' opinions on what constituted appropriate biochemical and physiological limits as preconditions for brain death testing, Twenty-two respondents (63%) felt that it was unacceptable to use reversal agents such as flumazenil and naloxone to reverse the effects of opioids or sedatives so as to

allow brain death testing. Only 11 (31%) would routinely assay for plasma levels of sedative drugs and 6 (17%) would routinely test thyroid function before brain death testing. Thirty respondents (83%) said it was unacceptable to rapidly correct hypernatremia solely to allow brain death testing (3)

In a study done in 5 major tertiary care hospitals in Pakistan including 28 (10.8%) final year medical students, 87 (33%) residents, 25 (10%) resident medical officers (RMO),and 37 (14%) Medical Officers and 32 (12%) consultants,. One hundred and thirteen doctors (44%) agreed that a person, whose brain stem is declared dead while the heart is functioning normally, is actually dead while 115 (44%) doctors disagreed to this definition. Twenty six doctors (10%) were either not sure or did not know the definition. Majority of the doctors, i.e. 146 (56%), thought that at least 2 physicians should be involved in diagnosing brain death while 86 (33%) stated that the opinion of 3 physicians should be obtained to declare brain death (4)

Two hundred and four doctors (78%) considered a neurologist's opinion necessary for diagnosing the patient as brain dead, while 36 (14%) disagreed to it and 18 (7%) were either not sure or did not know the answer to the question. Two hundred and fifty one doctors (97%) responded to the question regarding optimal time period to diagnose brain death. Eighty two (32%) considered 6 hours, 46 (17%) considered 12 hours, 85 (33%) considered 24 hours while 38 (15%) labeled more than 24 hours as optimal time period (4).

As far as confirmatory tests were concerned, 102 doctors (39%) were in favor of only clinical diagnosis and considered confirmatory tests as optional while 135 (52%) doctors disagreed to it and 22 (8%) were either not sure or did not know about the need for confirmatory tests. EEG testing was thought to be a pre-requisite to diagnose brain death by 194 doctors (75%) while 47 (18%) disagreed to it and 18 doctors (7%) were either not sure or did not known about EEG testing. One hundred and thirty seven doctors were in favor of "turning off" ventilator after the diagnosis of brain death and 84 doctors (32%) disagreed while 38 (15%) did not know or were not sure about "turning off" the ventilator system. Sixty seven doctors (26%) thought that turning off ventilator is a means of euthanasia in brain

dead patients and 94 doctors (36%) disagreed to it while almost equal number of doctors 93 (36%) were not sure or did not know about it. Thirty doctors (11%) agreed to turn off the ventilator in patients with unrecoverable neurological injury (vegetative state) but not technically brain stem dead and 176 (68%) disagreed while 45 doctors (18%) were either not sure or did not know about it. Religious beliefs can alter decision regarding disconnection of ventilator in brain dead patients according to 136 doctors (52%) while 83 (32 %) disagreed to it while 40 doctors (15%) were either not sure or did know about it(4)

In a study done in Brazil among doctors practicing at a hospital or another setting with an ICU or emergency and urgent care at the time of the interview, Approximately 123 (71%) correctly defined BD as the irreversible loss of all cortical and brainstem function. A total of 42% of the professionals considered themselves to have the highest level of confidence to explain this concept to the patient's family. The level of confidence was not significantly different between those who correctly defined BD and those who did not. It is noteworthy that among the 51 participants who incorrectly defined BD, 16 (31%) considered themselves to be at the maximum level of confidence. A total of 78 professionals (45%) reported difficulties in following the BD criteria. When comparing clinical professionals with surgical professionals, the latter reported a greater limitation, with 51% (26/51) reporting difficulty (OR = 1.42; p = 0.293). (94%) recognized the need to use complementary tests in the diagnosis of BD, and of these, 42% correctly identified all possible diagnostic tests (arteriography, electroencephalogram and trans cranial Doppler). Among those who recognized this need, almost all (162/163) reported at least one of the three correct tests as appropriate for BD diagnosis. Nevertheless, 13 professionals (8%) mistakenly indicated the use of cerebrospinal fluid examination and/or simple brain computed tomography (CT) scan as options for complementary diagnostic tests(5).

In another a study carried out on 90 doctors working in the ICU s of Teresina, Piaui, Brazil to evaluate their knowledge on brain death and correlate it

with time spent working in the medical profession, time spent working in ICU: Most (85.6%) of the doctors surveyed correctly defined the concept of brain death, data which positively correlated with length of time practicing medicine (p = 0.03), with a higher proportion of correct answers among intensive care doctors who had less than ten years of medical practice (96.8%).However there was no association between correct answers on understanding of brain death and length of time spent working in the ICU or the type of ICU in which the doctor worked. There was also no correlation between knowledge of the definition of brain death and the fact that the medical professional had attended a medical residency and whether he or she held the title of intensive care specialist. With regard to the requirement for additional tests, most intensive care doctors (94.4%) responded appropriately. When asked about their confidence in explaining brain death to the families of patients, the majority (84.4%) of doctors considered themselves to be within the two highest groups, with 40% very confident and 44.4% confident. There was also no correlation between this factor and the variables studied (6).

In a multicenter, observational study in Spain, on Intensive care practices in brain death diagnosis and organ donation, The diagnosis of brain death was based exclusively on clinical examination in only 92 patients (5%), while at least one ancillary test was used in 1752 patients (95%).The ancillary tests were used with the same frequency in hospitals with and without neurosurgery, except for CT with cerebral angiography, which was performed more commonly in hospitals without it (12% vs. 3%, $p < 0.000$). Moreover, 413 patients (22%) had brain death diagnosed by clinical examination, EEG and one additional ancillary test (7)

In a cross-sectional survey of knowledge and concepts among Health Professionals in four university-affiliated hospitals in Cleveland, Only 68 respondents (35%) correctly identified the legal and medical criteria for determining death. Personal concepts of death varied widely. Most respondents (58%) did not use a coherent concept of death consistently (8)

In a national survey done in Australian emergency doctors' and nurses' on their acceptance and knowledge regarding brain death, Most (86%) of the 599 medical and 212 nursing staff accepted brain death as a valid determination of death, but only 60% passed a 5- item-validated BD knowledge tool. Brain death knowledge was related to the acceptance of brain death (10).

In a study done in Mumbay,India among residents with 112 junior and 46 senior resident doctors in anesthesia, general surgery, Internal Medicine,Neurosurgery,Pediatrics and Urology departments , When the criteria for brain‐death declaration were assessed, majority of resident doctors were aware about the exact definition of brain death. Eighty resident doctors (91.95%) correctly defined it as complete cessation of brain activity including brainstem reflexes. They could differentiate between brain death and cardiac death as two different entities. Seventy‐three resident doctors (83.90%) stated that coma and vegetative state are two different conditions. Seventy resident doctors (80.45%) said 'yes'that it is mandatory to document the absence of brainstem reflexes at two examinations 6 h apart for documentation of brain death. However, only 25 resident doctors (54.73%) could correctly identify that absence of pupillary and corneal reflex, absence of oculovestibular reflex and absent grimace to noxious painful stimulus are required. Fifty‐six resident doctors (64.36%) responded positively that it is mandatory to do apnea test and 75 resident doctors (86.20%) knew about positive apnea test(10).

Regarding confirmatory test for brain death, 29 resident doctors (33.33%) responded that electroencephalogram should be done. Six resident doctors (6.89%) responded Somatosensory evoked potential, five responded as cerebral angiography (5.74%) and 47 resident doctors (54.02%) said that all above investigations should be done to confirm inconclusive apnea testing(10).

When asked about whether it is legal to disconnect life support in India, 49 resident doctors (56.32%) said no and 38 resident doctors said yes (43.67%). Only 11 resident doctors (12.64%) were aware about a panel of 4 physicians,

i.e., one neurosurgeon/neurologist, one treating physician and surgeon are mandatory to declare brain death in India (10).

Background

The concepts of life and death have always been complicated, but ever more so as medical and technological advances continue to extend the limits to saving life and prolonging physiological function. For previous generations, cardiorespiratory death was the sole clinical definition of death, often without any standard criteria, leading to the risk of misdiagnosis. As resuscitation techniques and mechanical ventilation developed, a new definition of death was needed. The idea of brain death/death by neurologic criteria was first recognized in 1959 as “coma depassé”(11) and subsequently described as “brain death” with the first published clinical definition in 1968, commonly known as the Harvard Brain Death Criteria(2). Since then, many other guidelines and protocols have been published, adopted, and revised throughout the world with general acceptance of the concept of brain death (12).

For more than 40 years, medical practitioners have been diagnosing death using neurological criteria. For nearly 200 years, we have been using the stethoscope, as a technological aid for circulatory criteria, to diagnose the same death. Our understanding and the criteria we use may have evolved, but our duty remains the same, to make a timely diagnosis of death whilst avoiding any diagnostic errors; an obligation medical professionals cannot and should not abdicate (2) .

The term ‘brain death’ is widely accepted by health-care professionals in most parts of the world. There are no published reports of recovery of neurologic function after a diagnosis of brain-death (10). Brain death is now accepted as the equivalent of cardiac death (3). Cardiac death usually follows within days or weeks even with continuation of mechanical ventilation and full supportive therapy .The ability to certify death when there is irreversible cessation of brainstem function enables specialists working in Intensive Care to withdraw futile treatment on humanitarian, ethical and (coincidentally) utilitarian grounds (13-19).

Determination of brain death requires a process of certification which includes identification of findings that provide a clear etiology of brain dysfunction. It also requires exclusion of conditions that may confound the clinical diagnosis of brain death. This is followed by a complete neurological examination confirming the irreversible dysfunction of brain including the apnea test which confirms failure of the respiratory center. Ancillary tests can be used when uncertainty exists about neurologic evaluation (20-22).

Most low-income countries have no neither legal nor clinical practice guidelines for brain death. The reasons cited for a lack of guidelines by low income countries respondents in one large global survey included: (1) lack of physician expertise; and (2) uncertainties about the concept .There is also sociocultural and/or religious resistance to this concept in many nations (20). Diagnosing brain death is a first step to addressing the futility of further intensive or invasive care and might influence triage decisions in low-resource areas. This may be especially relevant in low income countries, where hospital and intensive care unit beds are very scarce. Reframing the concept of brain death in the context of organ failure may motivate healthcare providers in low income countries to perform a relevant neurologic examination. Increased identification of brain death may be disproportionately beneficial to low income countries healthcare systems where specialists in neurology, neurological surgery and critical care are often absent. However, prospective research on this topic in low income settings is essentially absent.

It is essential that doctor are fully informed of the concept of brain death and are able to identify it correctly and treat the patient appropriately, according to the medical and legal provisions of a country. Determination of brain death has significant legal and ethical implications; hence, it should be diagnosed and documented carefully. Many brain dead patients are kept on life support needlessly because of lack of awareness among medical professionals (7).

Studies have shown substantial confusion, ambiguity, and lack of understanding about BD among health professionals, even among those who accept BD as being legally dead (4) .The aim of this study was to assess the level of knowledge, attitude and level of practice of brain death test among residents at TASH in the year 2020.

METHODS

This was a hospital based cross-sectional study conducted at TASH, the largest specialized hospital in Ethiopia. Residents of Neurology, Neurosurgery, Anesthesia, Internal medicine and Emergency medicine from different years of training were selected for the study due to their direct involvement in treating patients in emergency situation and critical patients with high risk of vegetative state or death. Pediatric department was excluded because of absence of well-established guidelines for brain death confirmation in the literatures. The study was conducted from October1 to October 20, 2020

Convenient sampling method was used due to the limited access to the residents due to the prevailing Covid 19 virus pandemic. Sample size was calculated to be 380 using expected prevalence of p=54.73%, taken from a similar study done in India. For a finite population size of 250 residents, the sample size was modified to sample size of 144.On line data collection was attempted but since response rate was too low to achieve the calculated size, face to face data collection was applied. A semi-structured questionnaire consisting of close-ended

questions was prepared from previous literatures and distributed to study participants. The collected data was checked for its completeness and the data coded and analyzed using SPSS 25 window and the result was presented using appropriate frequency distribution and cross tabulation for selected variables. Both descriptive and inferential analysis was used.

Protocol approvals were obtained from the ethical review Committee of the Department of Neurology .Consent was obtained from participants. Confidentiality was kept throughout the study.

Results

A total of 144 residents were polled with 123 responding with fully completed questionnaires giving a response rate of 88%.The distribution of respondents by field of specialty and year of residency is shown in figure 1.

Females accounted for only a quarter of the study participants {32.5%}.The range of the participants' age was between 25 and 33 years with a mean of 28.82{SD=1.76}. The study participants worked as a General Practitioner from 1 to 4 years before joining their residency program with a mean of 2 years{SD=0.79}. They had ICU attachments ranging from 1 to 8 months with a mean of 4 months {SD=2.00}.

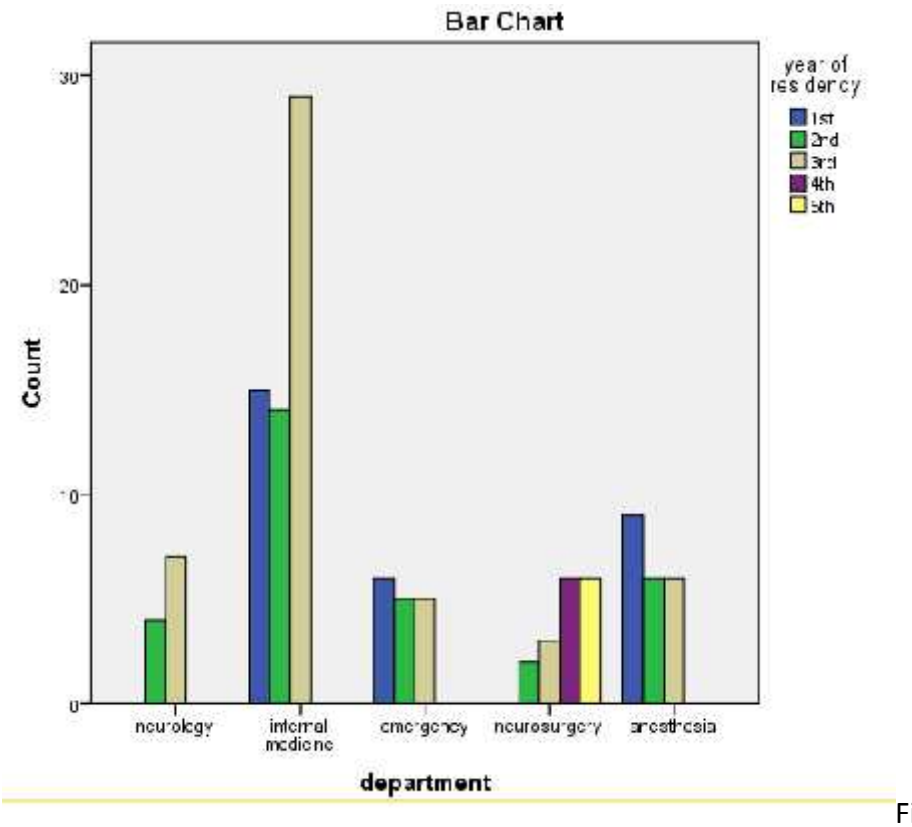

Figure 1.A bar chart showing distribution of participants in department and year of residency

Table 1, Responses to questions on brain death knowledge

Variables	Frequency (%)
The minimum core temperature (°C) of the patient to diagnose brain death: Correct answer(>36) Incorrect answers	 36(30.25) 83(69.75)
The minimum systolic blood pressure (mm Hg) of the patient to diagnose brain death: Correct answer(>100) Incorrect answers	 17(14.3) 102(85.7)
The temperature of water injected during caloric testing: Correct answer(Ice-cold) Incorrect answer	 86(72.3) 33(27.7)
The interval between testing each side of ear (min) in caloric testing: Correct answer (5min) Incorrect answer	 45(37.8) 74(62.2)
Is it mandatory to perform apnea test for brain death declaration? Yes	 85(71.4)

no	34(28.6)
Examination of patient should provide clear etiology of brain dysfunction before starting brain death test: Yes No	 56(47.1) 63(52.9)
The prerequisites for apnea test: Correct answer Incorrect answer	 94(79) 25(21)
Not an ancillary test used in brain death confirmation: Correct answer(Pulse oximetry) Incorrect answer	 49(41.2) 70(58.8)
The no of times to test for brain death before declaring death: Once Twice in a row Twice 12 hours apart Three times Patient individualized	 10(8.4) 18(15.1) 36(30.2) 37(31.2) 18(15.1)
Consent from family before starting brain death test:	

Agree	100(84)
Disagree	19(16)

One hundred nineteen residents {96.7%} replied" yes" when asked if they know brain death or not. They correctly responded that brain death and cardiac death are two different scenarios. Of those who claimed to know brain death, 38 residents {32%} answered wrongly to what brain death consists of. Participants' knowledge of the definition of brain death was related to field of specialty with more neurology and neurosurgery residents responding correctly than other departments {p=0.017}.Senior residents were also more likely to answer correctly than their juniors {p<0.001}.

Eighty five residents {71.4%} responded positively that it is mandatory to do apnea test and 68 residents {57%} correctly identified the criteria for apnea test. Senior residents were more likely to know the criteria for positive apnea tests {p=0.041}.Knowledge of apnea test criteria was also found to have association with field of specialty {0.001}. Regarding the confirmatory tests for brain death, only 49 residents {41.2%} correctly replied that pulse oximetry is not an ancillary test to confirm brain death. There was no relation between answering correctly to this question and how long the participants stayed at ICU {P=0.224}

Table 2.Association between brain death knowledge and participants 'department and year of residency

Variables	Department						Year of residency				
Definition of brain death:	N	NS	IM	EM	AN	Total	1ST	2ND	3RD	>3RD	Total
Correct	11	17	31	6	16	81	7	17	47	10	81
Incorrect	0	0	24	9	5	38	21	14	3	0	38
total	11	17	55	15	21	119	28	31	50	10	119
Chi square value	24.484						50.467				
P value	0.017						<0.001				
apnea test criteria											
Correct	10	17	30	6	5	68	15	17	39	0	71
Incorrect	1	0	25	9	16	51	13	14	11	10	48
total	11	17	55	15	21	119	28	31	50	10	119
Chi square value	32.99						21.704				
P value	0.001						0.041				

N=Neurology,NS=Neurosurgery,IM=Internal medicine,EM=Emergency medicine, AN=Anesthesia

Fifty four residents {45.38%} accepted brain death, agreeing that “brain death is a valid determination of death.” while the rest disagreed. Respondents that replied “disagree” were asked to select additional systems they think should fail to diagnose legal death with 46 of them {68.6%} selecting both cardiac and respiratory system. Almost all study participants from Neurology and Neurosurgery agree that brain death can be taken as legal death while most of of internal medicine and emergency medicine residents do not agree which shows association between department and attitude towards brain death as legal death{$p<0.001$ } .Attitude was also found to be related with year of residency with those senior residents tending to agree more likely($p<0.001$).There was no association between participants’ atittude towards brain death and their religioun{$p=0.108$}. Attitude towards brain death as legal death and the facility where the participants served before joining residency as well as how long they worked as a GP were found to be independent {$p=0.795$ and 0.236 respectively}.

Twenty eight residents {23.5%} were in favor of discontinuing any life support after the diagnosis of brain death and 34 residents {29.4%} in favor of continuing the MV until cardiac arrest occur while 57{47.9%} residents chose” let the family to decide”. The participants’ opinion on what they will do in brain dead patients with preserved cardiac activity seems to be affected by their field of specialty ($P<0.001$) and year of residency ($P<0.001$) as Neurology and neurosurgery residents and senior residents were more likely to opt for discontinuation of mechanical supports while junior residents and residents from other departments were in favor of giving the family the chance to decide or continue supportive care. The participants religious back ground was not associated with their decision on this scenario{$p=0.278$}.One hundred participants {84%} think the next of kin should be informed when starting brain death test while the remaining do not think it is necessary to have consent before starting the examination. There is a wide difference of opinion among the residents on how many times the brain death test should be done before declaring brain death with 30.2% of the participants in favor of doing it twice 12 hours apart while

31.2% of them thinks that it should be done 3 times before declaring brain death while the rest of the participants say that it should be patient individualized.

Table 3.Association between participants'attitude towards brain death and their department and year of residency

Variables	Department						Year of residency				
Brain death to confirm legal death:	N	NS	IM	EM	AN	Total	1ST	2ND	3RD	>3RD	Total
Agree	11	16	15	5	7	54	4	8	33	10	55
Dis agree	0	1	40	10	14	65	24	23	17	0	64
total	11	17	55	15	21	119	28	31	50	10	119
Chi square value	40.646						48.189				
P value	P<0.001						P<0.001				
Life support after BD											
Continue	2	0	23	5	4	34	16	7	11	0	34
Discontinue	7	13	5	1	3	28	0	5	16	10	31
Let family	2	4	27	10	14	57	12	19	23	0	54

decide total	11	17	55	15	21	119	28	31	50	10	119
Chi square value	47.331						44.370				
P value	P<0.001						P<0.001				

N=Neurology,NS-Neurosurgery,IM=Internal medicine,EM=Emergency medicine, AN=Anesthesia

Only 14 of the residents {11.7%} have ever done brain death tests all of whom usually measure vital signs, as well as check RBS before proceeding to brain death confirmation but 4 of them (28.6%) do not check for the cause before confirming brain death. All of them check pupillary reflex and do apnea tests whereas calorie test is performed by only 7 of them {50%}.Only 4 of the participants who have history of confirming brain death {28.57%} document the findings of the brain death tests on the medical records.

Discussion

Residents from different fields of specialty with more exposure to critically ill patients were surveyed and significant variability in their knowledge, attitude and the technical aspects of brain death testing was found. Thirty two percent of the participants were incorrect in responding to a question raised about the definition of brain death. This percentage is higher than the one observed in the India study done among resident doctors in which only 8.05% of the participants got it wrong (10).India has national guideline on brain death which might have played a role in increasing the level of knowledge about brain death as compared our case where the possible source of information may be text books read only for academic purposes. In a Brazilian study done among doctors practicing at a hospital setting with an ICU or emergency and urgent care, 71% of the doctors correctly defined BD (8) which is closer to our case although the participants' level of training is not specified. In a cross-sectional survey done among Health Professionals in four university-affiliated hospitals in Cleveland, Only 35% correctly identified the legal and medical criteria for determining death (8).

Eighty one residents {68%} correctly identified the criteria for positive apnea test which is again less than the Indian study (86.2%) (10). The duration of ICU attachment was found to affect knowledge of apnea test while department of study was not associated with it.Knowledge about brain death ancillary tests looks low as only about 41.2% 0f the participants were able to correctly identify that pulse oximetry is not a confirmatory test for brain death. It is difficult though

to test their knowledge with not only a single question but also an indirect way of assessing.

Most of the participants were shown to have difficulties in identifying the basic physiological limits which are taken as prerequisites to diagnose brain death. Only 30.25 percent of the study participants were able to correctly answer the question on the lower limit of temperature of patients before testing for brain death while those who chose the correct answer for the minimum systolic blood pressure were only 14.3 percent. Sixty -two percent of them did not know the time interval of calorie test between checking each side of ear.

Sixty five (54.6%) residents do not accept brain death as a legal death most of whom require both pulmonary and cardiac activities to stop to declare brain death. This may show that even the most well informed section of the population in our community still has negative attitude about brain death despite the fact that there are well written guidelines about the issue. This is a much lower level of acceptance even when compared to a previous study done in Australian emergency doctors and nurses on their acceptance and knowledge regarding brain death, most of whom (86%) accepted brain death as a valid determination of death(9). However another study done in 5 major tertiary care hospitals in Pakistan including final year medical students, residents, and consultants, showed a lower acceptance level compared to our data although again level of training varies. Forty-four percent of the study participants agreed that a person, whose brain stem is declared dead while the heart is functioning normally, is actually dead while 44% doctors disagreed to this definition. Ten percent were either not sure or did not know the definition (2). This may give us a hint that there is a lot of task ahead of us in increasing the awareness of the population about brain death before developing a national guideline on brain death and possible organ donation.

Twenty eight residents (23.5%) were in favor of discontinuing any life support after the diagnosis of brain death and thirty four residents (28.57%) in favor of continuing the MV until cardiac arrest occurs while 57(47.9%) residents want to let the family to decide. In a study done in India among residents, 43.67% of the participants said they would discontinue it while in the Pakistanis study, 53% of doctors were in favor of "turning off" ventilator after the diagnosis of brain death and 32% disagreed while 15% did not know or were not sure about "turning off" the ventilator system (2). As there is no national guideline concerning this issue in contrast to other countries including India, there seems to be more confusion among our clinicians with most of the participants letting the family to decide. This again is a burning problem to solve in the near future in order not only to economically use our scarce ICU set ups but also stop the unnecessary prolongation of family burden of futile efforts.

Even for academic purpose, the practice of brain death test is very low with only 11.7% of the residents having ever done brain death tests. This may be explained by several factors one of them being short duration ICU attachment all for less than a year. The technicality of apnea test and fear of complication from the procedure to the critically ill patient in case the patient is not actually brain dead may frustrate clinicians especially in set ups where there is no established guideline. More importantly, the incidence of cases which necessitate brain death test may be low. In a study done in Malawi, Out of 449 ICU admissions, brain death was diagnosed in 43 patients (9.6%) (23), which demonstrates low incidence especially in low income countries.

The similarity of my results to that of the previous Indian study in showing the wide gap among the study participants about brain death concept knowledge and attitude suggests that the difficulties encountered in brain death testing at the bedside are universal. Literature on KAP about brain death is sparse and most of the studies done so far are limited to high resource areas, and the majority are conducted on the general population or health care professional in general .There

was only one study done on residents about the tittle based on my search .There was no local or even continental study found about the study tittle for comparison using key search phrases like “knowledge, attitude and practice of brain death in Ethiopia/ Sub-Saharan Africa/ Africa”.

Conclusion

The majority of the residents know about the definition of brain death but most of them have difficulties in identifying the basic physiologic limits which are pre conditions to diagnose brain death. More than half of them don not accept brain death as a legal determinant of death. Their practice of brain death test is low.

Limitation of the study

Since the sampling was not random, some of the associations found in this specific study may not be generalizable to population level. Being a single center study, it may not represent residents in other institutions of the country. There was no valid assessment tool to compare the result of this study.

RECOMMENDATION

The authors recommend to do a multicenter survey among health care professionals as well as attitude study among the population at large in order to develop national guideline on brain death which may help us utilize our limited ICU set ups economically as well as Facilitate future initiation of organ donation procedures .

Based on the results of this study, more training is required to improve brain death knowledge to acceptable levels. This is likely to increase the acceptance of brain death. It may be reasonable to recommend including more neuroscience and ICU attachments in our residency curriculums and give seminars on brain death to residents at all level of residency and field of specialty**.**

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Annex 1

Abbreviations

GP=General Practitioner

ICU=Intensive Care Unit

KAP= Knowledge, Attitude and Practice

MV=Mechanical Ventilation

RBS=Random Blood Sugar

SBP=Systolic Blood Pressure

T=Temperature

TASH=Tikur Anbessa Specialized Hospital

Annex 2-Declaration

I, the undersigned, declare that this post graduate thesis is my original work, has not been presented for a degree in this or any other university and that all sources of material used in the thesis have been duly acknowledged.

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