

Thought, Attitudes, and Practices of the Anatomy Departments on Receiving and Embalming Cadavers During the Pandemic Process

Pensamiento, Actitudes y Prácticas de los Departamentos de Anatomía sobre la Recepción y Embalsamamiento de Cadáveres Durante el Proceso Pandémico

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SUMMARY: During the Covid-19 pandemic that has marked the last years, while governments tried to control the spread of the virus, many-body donation programs were suspended due to difficulties that could potentially be encountered. Given the low body donation acceptance rates during this period, through this study we aimed to evaluate academics' knowledge, attitudes, and behaviors in cadaver acceptance and embalming practices during the pandemic. The research population of the study consisted of the faculty of 112 universities in Turkey who taught in under graduate and graduate programs in the Anatomy Department in 2020. An electronic questionnaire of 24 items, including demographic data, was distributed to the participants' official e-mail addresses. In addition, support was received from the Turkish Anatomy and Clinical Anatomy Society, whose members were also approached through their official group e-mail accounts. Answers were collected from 78 (39 %) out of 200 academics. The findings of the study were under 5 headings (information about cadaver donation and imported cadavers, attitude towards importation of cadavers and acceptance of body donations, precautions against contagion in importation of cadavers and acceptance of body donations and thoughts on their adequacy, considerations for adoption of cadavers for post-graduation education, advice on avoiding contagion in cadaver embalming) were collected and analyzed. The study highlights the importance of cadaver acceptance and embalming practices for medical education to minimally continue in the post-pandemic period. It can also serve as a reference for being cautious when faced with similar situations in the future.

KEY WORDS: Body donations; Imported cadavers; Covid 19; Anatomy education.

INTRODUCTION

The science of anatomy, which is accepted as the cornerstone of medical education, is the basis of safe clinical practices, especially surgical disciplines (Turney, 2007). Although there has been a decrease in traditional cadaver-based anatomy education worldwide as a result of shifting to an integrated/system-based curriculum (Tibrewal *et al.*, 2006; Drake *et al.*, 2009), many assistants and young surgeons attend cadaver dissection courses, especially related to surgical anatomy and procedures, to obtain detailed information for correct medical practice (Smith & Mathias, 2011). Among the reasons, primarily for surgeons to attend cadaver courses, Goodwin (2000) reported a continuous increase in medico-legal lawsuits for surgical malpractice. In his study, Ellis (2002) also stated the anatomical findings

presented to the Medical Defense Association in 1995 and 2000 in England. Reasons such as the 7-fold increase in claims about incompetence can be counted (Estai & Bunt, 2016). However, it has been reported that many medical faculties continue to reduce the teaching time devoted to anatomy teaching. Anatomy knowledge among undergraduate and graduate (medicine and dentistry) students is declining (Moxham & Plaisant, 2007; Smith & Mathias, 2011). Therefore, some experts believe that dissection courses are still indispensable for students to gain anatomical knowledge (Korf *et al.*, 2008).

Dissection has been the primary anatomy teaching method for over 400 years (Azer & Eizenberg, 2007).

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Learning to use the dissection of human cadavers has advantages that are not easy to quantify. These include developing active and deep learning, preparing students for clinical practice, preparing students to face death, practicing the manual skill, understanding the relationship between patients' symptoms and pathology (Azer & Eizenberg, 2007; Fruhstorfer *et al.*, 2011). It also contributes to developing their vision as doctors, and there is no doubt that cadaver dissection plays a vital role in training future doctors (Netterstrøm & Kayser, 2008).

However, a study investigating students' perceptions of anatomy teaching resources stated that both anatomists and students strongly preferred cadaver dissection in anatomy teaching (Böckers *et al.*, 2010).

With the COVID-19 epidemic that marked the last period, the spread of the COVID-19 virus was tried to be controlled with the compulsory stay-at-home policy administered by the governments in many countries worldwide (Mervosh *et al.*, 2020). During the pandemic period, distance education was started to continue quickly and effectively (UNESCO, 2022). Likewise, universities in many countries have switched to distance education in pre-and post-graduate medical education (Sarac, 2021). During this period, many body donation programs were suspended due to possible problems and the widespread closure of university campuses, and difficulties occurred in providing practical experience-based anatomy education online (Brassett *et al.*, 2020). The idea that an anatomy education without cadavers is unthinkable among anatomists was expressed in national and international online meetings, and a series of measures were tried to be taken based on universities, countries, and the world. The International Federation of Associations of Anatomists (IFAA) has issued an advisory declaration called best practice guidelines for donor donation during the pandemic period (I'faadmin, 2022). Despite this, an official application has not been prepared based on institutions in our country. Cadaver courses were suspended for a period, but no official decision was made to stop donor donation or donor procurement. This study aimed to "evaluate academicians' knowledge, attitudes, and behaviors in cadaver acceptance and embalming practices during the pandemic," based on the lack of practice for body donation acceptance during the pandemic period.

MATERIAL AND METHOD

In this study, electronic questionnaires consisting of questions about their knowledge and attitudes towards the

acceptance of cadavers during the pandemic process were presented to the academic staff working in the undergraduate and graduate programs of 112 state and foundation universities in 2020, working in the anatomy department in 2020. The questionnaire form consisted of a total of 24 items, including demographic data. All questions were asked to be answered. The official e-mails of the medical faculties of the universities were used in the distribution of the questionnaire and data collection. Support was received from the Turkish Anatomy and Clinical Anatomy Society, and the participants were tried to be reached through the official mail group. 78 (39 %) of approximately 200 academic staff answered the questionnaire. Ethical approval of the study was obtained from I'zmir Bakırçay University Non-Interventional Ethics Committee, and the study permit was obtained from the Ministry of Health. SPSS 23.0 program was used in the evaluation of the data. Frequency values were calculated for the descriptive findings obtained from the survey data of the study group. The data obtained from the research was presented using descriptive criteria. T-test and analysis of variance were used to compare the variables determined by the measurement between groups. The Chi-square test compared the variables defined by counting between groups. In other evaluations, parametric and non-parametric tests were used under the data. P-value < 0.05 was accepted as the statistical significance level.

RESULTS

Demographic Findings. 55.1 % of the instructors participating in the study were male, and the average age of the participants was calculated as 40.84 (min.=25, max=60). 73.1 % of the participants were married. 20.5 % (n=16) of the participants were research assistants, 9 % (n=7) lecturers, 2.6 % (n=2) specialist physicians, 23.1 % (n=18) physician faculty members, 21.8 % (n=17) were associate professors and 23.1 % (n=18) were professors. Of the participants, 15.4 % (n=12) were the head of the department, 2.6 % (n=2), 5.1 % (n=4) were the department heads, and 1.3 % (n=1) were the deans. 88.6 % of the participants (n=69, min=5 years, max=37 years) had five years or more professional experience in anatomy, 53.9 % (n= 42, min=5, max=35) had five years or more was working in the department of the university.

Information About Cadaver Donation and Imported Cadavers. "Are you given the guidelines to be followed regarding donations or imported cadavers in your institution (by the dean's office, chief physician, department head, etc.)?" 48.7 % (n=38) answered yes to the question, (n=7) answered I do not know.

In the current situation, "Has any institutional information been given to the academic staff in your institution that the activities of the body donation program will be suspended or will continue?" 76.9 % (n=60) answered yes, 5.1 % (n=4) answered I do not know.

Participants reported that 92.3 % (n=72) of the information and secretariat works actively continued in the institution they worked in during the pandemic process. In the tools of these notifications, 62.8 % (n=49) of the methods they used via telephone, 23.1 % (n=18) of them via the internet (Zoom, Skype, etc.), 56.4 % (n=44) of them via e-mail, 30.8 % (n=24) stated that it was done through face-to-face interviews. In comparison, 7.7 % (n=6) noted that no application was made during this period.

Attitude Towards Importation of Cadavers and Acceptance of Body Donations During The Pandemic Period. About the feasibility of accepting cadaver donations during the pandemic period (New type of coronavirus); 20.5 % (n=16) strongly disagree, 17.9 % (n=14) disagree, 11.5 % (n=9) undecided, 17.9 % (n=14) agree and 32.1 % (n=25) strongly agree.

Regarding the suitability of cadaver import during the pandemic period (New type of coronavirus); 25.6 % (n=20) strongly disagree, 20.5 % (n=16) disagree, 15.4 % (n=12) undecided, 17.9 % (n=14) agree and 20.5 % (n=16) strongly agree.

Precautions Against Contagion in Importation of Cadavers and Acceptance of Body Donations During the Pandemic Period and Thoughts on Their Adequacy. About the adequacy of acting within the framework of social distance rules for the health and safety of the personnel who will meet with the donors and/or their relatives during the pandemic period (New type of coronavirus); 12.8 % (n=10) strongly disagree, 14.1 % (n=11) disagree, 14.1 % (n=11) undecided, 25.6 % (n=20) agree and 33.3 % (n=26) strongly agree.

Opinions of the participants about the low probability of getting a new type of coronavirus from a dead body; 26.9 % (n=21) strongly disagree, 20.5 % (n=16) disagree, 16.7 % (n=13) undecided, 17.9 % (n=14) agree and 17.9 % (n=14) strongly agree.

In the pandemic period, cadaver embalming will be sufficient to take precautions against the new type of coronavirus; 10.3 % (n=8) strongly disagree, 25.6 % (n=20) disagree, 21.8 % (n=17) undecided, 26.9 % (n=21) agree and 15.4 % (n=12) strongly agree.

The receiving institutions regarding the imported cadavers during the pandemic period have taken adequate (necessary) measures against the new type of coronavirus; 14.1 % (n=11) strongly disagree, 21.8 % (n=17) disagree, 38.5 % (n=30) undecided, 15.4 % (n=12) agree and 10.3 % (n=8) strongly agree.

In the pandemic period, the negative result of the COVID-19 PCR test in imported or donated cadavers is sufficient in terms of employee health and safety; 9 % (n=7) strongly disagree, 25.6 % (n=20) disagree, 38.5 % (n=30) undecided, 14.1 % (n=11) agree and 12.8 % (n=10) strongly agree.

During the pandemic period, the general protective measures are sufficient for the health and safety of all personnel responsible for the reception, transport, embalming, and storage of cadavers; 11.5 % (n=9) strongly disagree, 28.2 % (n=22) disagree, 17.9 % (n=14) undecided, 28.2 % (n=22) agree and 14.1 % (n=11) strongly agree.

During the pandemic period, 16.7 % (n=13) strongly disagree, 23.1 % (n=18) disagree, 20.5 % (n=) that the use of Personal Protective Equipment (PPE) is sufficient for the health and safety of all personnel responsible for receiving, transporting, embalming and storing cadavers 16) undecided, 23.1 % (n=18) agree and 16.7 % (n=13) strongly agree.

During the pandemic period, 11.5 % (n=9) strongly disagree, 17.9 % (n=14) disagree, 26.9 % (n=) that training (training) is sufficient for the health and safety of all personnel responsible for receiving, transporting, embalming, and storing cadavers 21) undecided, 26.9 % (n=21) agree and 16.7 % (n=13) strongly agree.

Considerations for Adoption of Cadavers for Post-Graduation Education in The Pandemic Process. Regarding the need to continue postgraduate training in newly donated and imported cadavers by taking necessary precautions during the pandemic; 10.3 % (n=8) strongly disagree, 14.1 % (n=11) disagree, 14.1 % (n=11) undecided, 30.8 % (n=24) agree and 30.8 % (n=24) strongly agree.

Advice on Avoiding Contagion in Cadaver Embalming During the Pandemic Process. When the participants were asked which embalming method would recommend taking precautions against the new type of coronavirus during the pandemic period; 70.5 % (n=55) standard formaldehyde method, 5.1 % (n=4) at least 5 % formaldehyde (+ethanol+phenol) solutions, 19.2 % (n=15) without comment, 1.3 % (n=1) no method. However, some participants also gave the following opinions, alcohol should be added to embalming solutions, alcohol-based good fix

solution, the need to freeze after formaldehyde or alcohol bath, and one participant stated that it is not possible to transmit COVID infection from a cadaver; therefore embalming should be done according to use.

DISCUSSION

The inclusion of human body dissection in the anatomy course curriculum has been described as a critical educational experience for the best understanding of anatomical structures and concepts. Anatomy Body Donation Programs (ADPs) are entrusted with the ethical acquisition of body donations by the anatomy education curriculum in basic and clinical sciences (McCumber *et al.*, 2021). This study was carried out to determine the attitudes and behaviors of ADPs in fulfilling their duties and responsibilities during the pandemic period.

Information About Cadaver Donation and Imported Cadavers. 48.7 % of the participants answered yes to the question, "Are you given the guidelines to be followed regarding a donation or imported cadavers in your institution (by the dean's office, chief physician, department head, etc.)?". This situation was interpreted as differences in practices between institutions during the pandemic and that a nationally standard procedure could not be followed. In a study conducted in centers associated with institutional structures within the state or private sector, which carry out 89 body donation programs in the USA, it was reported that there were differences (McCumber *et al.*, 2021). This situation has been associated with the fact that there is no complete idea about the course of the pandemic worldwide. To the question "Has any institutional information been given to the academic staff in your institution that the activities of the body donation program will be suspended or will continue?", 76 % of the participants answered no, not done. This situation was interpreted as confusion between institutions regarding a donation to the body, the absence of standardization, and differences in practices during the pandemic. However, the Government of India has issued guidelines on managing the dead body due to COVID-19 (Government of India, Ministry of Health & Family Welfare, Directorate General of Health Services, 2020). The COVID-19 guide was published in our country, and the rules to be followed in Morgue and Burial Services were determined by the Ministry of Health. Still, no application regarding body donation was put into effect during the pandemic.

Manzanares-Céspedes *et al.* (2021) stated in their study that the lots of Spanish Universitysuspended body donation programs in universities in the light of best

practices-management and preventive measures during the pandemic period, accompanied by its laws, as well as national and international regulations, guides, and technical reports.

According to the study data, 92.3 % of the participants stated that cadaver donations were accepted in the institutions where they work. In a survey by McCumber *et al.* (2021) in the USA, it was reported that anatomical donation programs received 72.2 % of donations. In the study by Brassett *et al.* (2020) the Universities of Aberdeen, Cambridge, Edinburgh, Glasgow, Oxford, RCSI, and Imperial College London decided to suspend the body donation program for a certain period. In contrast, the University of Dundee agreed not to accept suspected or confirmed cases of COVID-19, while in Munich, the body donation program has not been suspended. However, potential donors infected with SARS-CoV-2 were not accepted, and incoming donors were reported to be tested for the virus (Brassett *et al.* 2020). In our study about accepting body donations, the participants were informed, and secretarial works were done via telephone at 62.8 %, e-mail at 56.4 %, and interactive communication tools (zoom, Skype, etc.) at 23.1 %, and at 30.8 %. It was found that it was done face to face. This situation, along with the warnings of all governments and health-related institutions worldwide, has been interpreted as the mask, distance, cleaning rule, which is the TurkishMinistry Of Health motto, and that the participants take their precautions.

Attitude Towards Importation of Cadavers and Acceptance of Body Donations During The Pandemic Period. In this study, it was seen that the participants had a serious disagreement on the acceptance of cadaver donation and the acceptance of import. However, judging by the cadaver acceptance rate, this is stated in the work of Singh & Pakhiddey (2020), "Due to the lack of strict guidelines on accepting or not accepting a non-COVID body, we can accept a donated body provided that the deceased is COVID negative, does not come from a quarantine zone, has no questionable history, and is fulfilled" (Singh & Pakhiddey, 2020) was interpreted as a continuation of cadaver acceptance, in agreement with the thought. When the answers are given the option "I think the probability of getting a new type of coronavirus from a dead body is low" are examined, it was found that 26.9 % of the participants strongly disagree, 20.5 % disagree, and 16 % are undecided. This is due to media reports such as "Scientists in Thailand reported the first known case of COVID-19 infection from a dead person" (Baldwin, 2020) "There is a possibility of virus in the fluids coming out of the dead in washing and burial procedures" (Elmacioglu, 2020) or as a result of the practices carried out by the governments in various countries in the world under preventive measures (such as burial in a coffin and a

special burial place for those who died from the coronavirus (Neyran & Hamsici, 2020) obligatory cremation of the deceased in France as in many countries of the world (Crubézy & Telmon, 2020). However, it was interpreted that it could be due to situations such as not having enough information about the virus and mutations. In general, however, the potential risk of contamination with the bodies of deceased persons with suspected or confirmed COVID-19 is considered low (Finegan *et al.*, 2020).

In the literature, there are no reports of coronavirus transmission during/after cadaveric dissection and of individuals infected from exposure to the bodies of deceased persons (Singh & Pakhiddey, 2020). However, the virus has been reported to be viable in water for seven days (Tran *et al.*, 2021), in aerosols for up to 3 hours, on copper for up to 4 hours, on cardboard for up to 24 hours, and on plastic and stainless steel for up to 2-3 days (van Doremalen *et al.*, 2020). Therefore, considering that it may be potentially contagious to personnel when receiving and embalming the body (Rajasekhar & Dinesh Kumar, 2021), the safety measures applied for the receipt and primary use of any human cadaver should cover the risk of COVID-19 infection, and taking appropriate precautions is essential for the health of healthcare professionals and the prevention of transmission is thought to be.

Precautions Against Contagion in Importation of Cadavers and Acceptance of Body Donations and Thoughts on Their Adequacy during the Pandemic Period - Recommendations for Avoiding Contagion in Cadaver Embalming During the Pandemic Process. The participants' opinions on the subject of "I think cadaver embalming will be sufficient to take precautions against the new type of coronavirus in body donation during the pandemic period"; 10.3 % strongly disagree, 25.6 % disagree, and 21.6 % undecided. In addition, to the question, "Which embalming method would you recommend in order to take precautions for the protection of cadavers against the new type of coronavirus during the pandemic period?"; 70.5 % of the participants were asked with the standard formaldehyde method, 5.1 % with solutions prepared with more than 5 % formaldehyde+ethanol+phenol compounds, and 2.6 % expressed their opinion on the preservation of cadavers using the plastination method. Formaldehyde inactivates the virus by combining with non-protonated amino acid groups such as lysine to form hydroxymethylamine. Intermolecular or intermolecular methylene crosslinks by combining hydroxymethylamine with amino, amide, guanidyl, phenolic or imidazole groups of amino acids (Jiang & Schwendeman, 2000). SARS-CoV-1 is neutralized using various disinfectants such as Ethanol: 62-71 % (within 30 seconds), Hydrogen Peroxide: 0.5 %

(within 1 minute), or Sodium Hypochlorite: 0.21 % (within 30 seconds). Formaldehyde: 0.7-1 % (within 2 minutes), Glutaraldehyde: 0.5-2.5 % (within 5 minutes) have been reported to inactivate SARS-CoV-1 (Kampf *et al.*, 2020). Phenol is used as a disinfectant in an embalming solution at a 5 % concentration. Therefore, an ethanol and phenol-based embalming solution has been reported to inactivate SARS-CoV-2 as soon as possible effectively (Rajasekhar & Dinesh Kumar, 2021).

Our study states that the participants mostly took adequate precautions to receive the imported cadavers and take sufficient precautions against COVID-19. However, the negative result of the COVID-19 PCR test in imported cadavers or body donations is thought to be not enough in terms of employee health and safety.

Thoughts on Contractor Firms in The Importation of Cadavers During The Pandemic Process. Regarding the measures taken by the contractor companies in imported cadavers, 61.5 % of the participants stated that they ensured the disinfection of the cadavers, 59 % of them said that the cadavers were preserved, and 61.5 % of them performed the COVID-19 PCR test. Although the import of cadavers has been stopped for a short time due to the closure of the countries and the interruption of education in many countries, the supply has started to be provided again in our country with the opening according to the course of the pandemic. Companies that supply cadavers in our country have reported serving in line with the practices of the American Association of Tissue Banks (AATB) and the Centers for Disease Control (CDC). Together with the existing procedures, they use COVID-19 PCR-based tests for cadaver testing. They report all the cadaver data and provide cadavers as freshly frozen or fixed cadavers upon the request of the institutions (Kabadayı, 2020). During the pandemic period, the participants stated that the general protective measures are sufficient for the health and safety of all personnel responsible for the reception, transport, embalming, and storage of cadavers. At these stages, it was concluded that there is a general uncertainty about the adequacy of Personal Protective Equipment (PPE) for the personnel. However, both the World Health Organization and the IFAA have presented precautionary recommendations on this issue (International Federation of Associations of Anatomists, 2021; World Health Organization, 2022).

However, there was no evidence of individuals infected by contact with the bodies of persons who died from COVID-19 (World Health Organization, 2020). This situation was interpreted as acting in line with the recommended recommendations that would be beneficial for the health and safety of the personnel.

In the research, feedback was received to benefit the person to undergo in-service training. However, the units should evaluate the result of the training given to the personnel, and it is thought that it would be beneficial to update their practices regarding this.

The majority of the participants (61.6 %) expressed a positive opinion about continuing post-graduate training in the cadavers provided with the security measures taken.

As a result, it can be said that Turkey's anatomy units were unprepared for a pandemic situation worldwide, and it can be said that practices are being carried out to continue medical education at a minimum level in the post-pandemic period. With the learning of the current pandemic factor, COVID-19, it is thought that it will be helpful to be cautious in the face of future pandemic situations by ensuring that the anatomy body donation is not affected and its continuity continues in the light of the measures.

Suggestions. Personal protective equipment should be provided following the usage conditions according to the number of people, and spares should be kept.

Although it is not enough to adopt pre-COVID-19 screening criteria to accept donated organs or bodies, appropriate storage and tests should be repeated at specific periods.

The embalming protocol before COVID-19 may not be sufficient to disinfect the bodies for SARS-CoV-2; therefore, scientific studies should be conducted on this subject, and new protocols should be developed.

Anatomists should be consulted regarding the procedures to be performed in the death and burial procedures of individuals who have died from suspected diseases such as COVID-19.

Current situations regarding the promotion of body donation should be shared, and necessary precautions should be taken.

To deal with future pandemics, a protocol should be developed that will allow us to respond faster and better than we do now, and digital transformations should be made that will make the abandonment of medical education perhaps feeling the same about cadavers.

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RESUMEN: Durante la pandemia de COVID-19, que ha marcado los últimos años, mientras los gobiernos intentaban controlar la propagación del virus, muchos programas de donación de cuerpos fueron suspendidos por las dificultades que se podían encontrar. Dadas las bajas tasas de aceptación de la donación de cuerpos durante este período, a través de este estudio buscamos evaluar el conocimiento, las actitudes y los comportamientos de los académicos en la aceptación de cadáveres y las prácticas de embalsamamiento durante la pandemia. El estudio se realizó el año 2020 en los programas de pregrado y posgrado de los Departamentos de Anatomía de 112 universidades de Turquía. Se distribuyó un cuestionario electrónico de 24 ítems, incluidos datos demográficos, a los participantes por correo electrónico oficial. Además, se recibió el apoyo de la Sociedad Turca de Anatomía y Anatomía Clínica, cuyos miembros también fueron contactados a través de las cuentas de correo electrónico de su grupo oficial. Se recopilaron respuestas de 78 (39 %) de 200 académicos. Los hallazgos del estudio se ubicaron en 5 encabezados (información sobre donación de cadáveres y cadáveres importados, actitud hacia la importación de cadáveres y aceptación de donaciones de cuerpos, precauciones contra el contagio en la importación de cadáveres y aceptación de donaciones de cuerpos y opiniones sobre su idoneidad, consideraciones para la adopción de cadáveres para la educación de posgrado y consejos para evitar el contagio en el embalsamamiento de cadáveres). El estudio destaca la importancia de la aceptación de cadáveres y las prácticas de embalsamamiento para que la educación médica continúe mínimamente en el período posterior a la pandemia. También puede servir como referencia para tenerse presente ante situaciones similares en el futuro.

PALABRAS CLAVE: Donación de cuerpos; Cadáveres importados; COVID-19; Educación de la anatomía.

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