Meta-regression analysis to determine the effect of knowledge of the concept of brain death on the attitude towards organ donation among medical students

Análisis de metarregresión para determinar el efecto del conocimiento del concepto de muerte encefálica en la actitud hacia la donación de órganos entre los estudiantes de Medicina

Dear Editor,

Acceptance of the concept of brain death (BD) as the meaning that a person died has been key to organ transplantation, as the majority of organ donors are people who have died and are in BD. However, lack of understanding of this concept is one of the main psychosocial reasons reported against donation, especially in relation to the fear to an only apparent dead.

Among healthcare professionals and medical students, the attitude towards organ donation is relatively positive,[1–3] but a significant proportion still lack a full understanding of the concept of BD.[1–3] A close association has been described between knowledge about the concept of BD and attitude towards organ donation in almost all social groups.[1–4] However, among medical students results have been conflicting. While a Spanish national study[2,3] found a clear relationship between knowledge about BD and attitude towards organ donation, many other studies have failed to confirm these findings and have often reported the opposite.[2,3,5–8]

The aim of this study is to determine the effect of knowledge of the concept of BD has on the attitude of medical students towards donating their own organs by performing a meta-regression analysis.

In order to be included in the meta-regression analysis, studies had to meet the following criteria: *1)* report the rate of participants with a favourable attitude towards donating their own organs after death and the rate of participants who were aware of the concept of BD; *2)* participants had to be medical students; and *3)* the studies had to have an observational methodology with no experimental manipulation.

A search was carried out in the electronic databases PubMed, CINALH Complete and PsycInfo using the following combination of keywords: (Organ Donation AND Attitude AND Medical Students). We reviewed 315 references, of which 19 articles met the inclusion criteria, providing data from 20 samples (Table 1).

Two coders independently extracted the rates of participants with a favourable attitude towards organ donation and the rates of participants who were aware of the concept of BD. The result was the proportion of students in favour. Assuming that the sample of studies represented different populations, the overall effect was calculated with a random effects model, where each study was weighted by its precision, which depended mainly on the sample size. To verify the effect of the percentage of students who were aware of the concept of BD on the result, a meta-regression analysis was carried out under the mixed effects model, calculating the QR statistic and the percentage of variance explained by the moderating variable R2.[9] All the data were analysed with the statistical software Comprehensive Meta-Analysis CMA 3.0 (Biostat Inc.).[10]

The overall magnitude of the effect of the 20 studies yielded a ratio of 0.78 (95% CI: 0.73−0.82), indicating that a combined percentage of 78% of students were in favour of donating their own organs after death. As the heterogeneity analysis showed a high and significant variability between the effect sizes of the studies (Q[19] = 853.22, $P < .000$; I2 = 97.77%), we went on to check whether or not knowledge about BD was one explanation for the variability.

The results of the meta-regression analysis showed that knowledge about the concept of BD was not a significant predictor of magnitude of the effect (bj = –0.01, Q1 = 0.78, $P = .38$), with the percentage of explained variance being 5%. Fig. 1 shows the graph with the line derived from the meta-regression analysis, confirming the absence of association between the variables studied.

Therefore, the differences between the rates of students in favour reported by the studies were not related to the percentage of students who were aware of the concept of BD.

It is striking that several studies show little knowledge about the concept of BD among medical students, whether in the USA,[5] in Europe[6,7] or in Asia.[8] One such study by Edwards et al.[5] in the USA reports that only 28% understood the concept, while in the Polish study by Rydzewska et al.,[6] only 21.97% were aware of the concept. It should be noted that in studies conducted across all the academic years, such as

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Table 1 – Main characteristics of the studies analysing knowledge about the concept of brain death and its relationship with attitude towards organ donation among medical students.

	Author	Citation	Year	Country	N	Know about BD concept	Attitude in favour of organ donation
1	Akkas M.	Med Sci Monit. 2018;24:6918-6924	2013	Turkey	100 100	50% 70%	54% 88%
2	Atamañuk A. N.	Transplant Proc. 2018;50:2976-2980	2016	Argentina	1,012	58.1%	81.9%
3	Bilgel H.	Transplant Med. 2006;18:91–96	2004	Turkey	409	86.5%	58.4%
4	Chung C. K.	Hong Kong Med J. 2008;14:278-285	2006	China	655	67.2%	85%
5	Dutra M.	Transplant Proc. 2004;36:818-820	2002	Brazil	779	82.4%	69.2%
6	Edwards T. M.	J Natl Med Assoc. 2007;99:131-137	2005	USA	500	28%	82.4%
7	El-Agroudy A. E.	Saudi J Kidney Dis Transpl. 2019;30:83-96	2017	Bahrain	376	74.5%	71.8%
8	Figueroa C. A.	Transplant Proc. 2013;45:2093-2097	2011	The Nether-lands	506	46.2%	79.8%
9	Kozlik P.	Transplant Proc. 2014;46:2479-2486	2012	Poland	400	85%	90.5%
10	Lima C. X.	Transplant Proc. 2010;42:1466-1471	2007	Brazil	300	67%	62%
11	Marqués-Lespier J. M.	PRHSJ. 2013;32:187-193	2008	Puerto Rico	227	80%	88.5%
12	Najafizadeh K.	Transplant Proc. 2009;41:2707-2710	2006	Iran	41	95.1%	87.8%
13	Ohwaki K.	Clin Transplant. 2006;20:416-422	2004	Japan	388	46%	59%
14	Ríos A.	Ethn Health. 2019;24:443-461	2011	Spain	9,275	66.7%	80%
15	Rydzewska M.	Transplant Proc. 2018;50:1939-1945	2016	Poland	569	22%	93%
16	Sahin H.	Exp Clin Transplant. 2015;1-9	2013	Several	1,541	51.3%	94.4%
17	Sebastián-Ruiz M. J.	Gac Med Mex. 2017;153:432-442	2015	Mexico	3,056	68%	74%
18	Tagizadieh A.	Transplant Proc. 2018;50:2966-2970	2016	Iran	400	57%	85%
19	Zhang L.	Transplantation. 2014; 1-8	2012	China	199	67.8%	32.2%

the Spanish one,[2,3] the level of knowledge improves as the students advance. Only 51% of first-year students were aware that BD means the person has died, a lower rate than that reported for the population as a whole.[4] However, understanding improves over time and 89% of students in year 6th knew the concept. It is clear that information on the subject and clinical experience are factors that facilitate knowledge about and acceptance of the concept.

As shown in Table 1, there are very few studies that have analysed knowledge of the concept of BD among students, and the data they present is confounding. Meta-analytical techniques may be interesting in such situations, as they contribute to the synthesis of existing data and help establish conclusions. In this case, the lack of association between knowledge about the concept of BD among medical students and their attitude towards organ donation was striking.

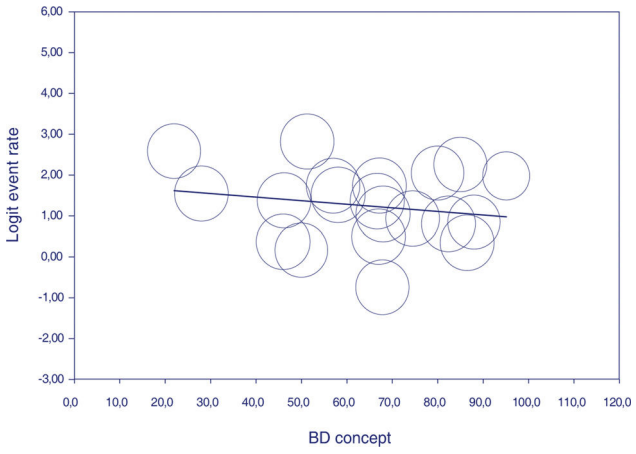

Fig. 1 – Regression line between the logarithmic rates of students in favour and the percentage of students who are aware of the concept of brain death.

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Does food ingestion during hemodialysis lead to change in hepatic oxygenation?

La ingestión de alimentos durante la hemodiálisis, ¿produce cambios en la oxigenación hepática?

Dear Editor,

Food ingestion during hemodialysis (HD) reportedly decreases relative changes in blood volume (%ΔBV).[1] However, the influence of intradialytic food ingestion on changes in systemic tissue oxygenation remains unclear. Here we report a case of deteriorated hepatic oxygenation with food ingestion during HD despite cerebral oxygenation being well maintained. A 68-year-old woman received HD therapy three times per week due to chronic glomerulonephritis. She usually ate a meal at each HD session, after which intradialytic hypotension (IDH) sometimes occurred. Therefore, in addition to the blood pressure measurement, we monitored the %ΔBV using a BV monitor (Nikkiso, Tokyo, Japan). Furthermore, cerebral and hepatic regional oxygen saturation (rSO_2) were monitored using an INVOS 5100c oxygen saturation monitor (Covidien Japan, Tokyo, Japan) to investigate the association between changes in tissue oxygenation and food ingestion during HD with her informed consent. She ingested 100 g of rice, 200 g of side dishes, and 200 mL of water between 120 min and 150 min after HD initiation. During this monitoring session, her blood pressure did not change, while the %ΔBV decreased soon after food ingestion. In addition, prior to the decrease in %ΔBV, the hepatic rSO_2 rapidly decreased in response to food ingestion, whereas the cerebral rSO_2 was maintained until the end of HD (Fig. 1).

Intrahepatic circulation consists of two different blood supply, one is from hepatic artery and the other is from portal vein. Oxygen saturation in portal vein was low compared with that in systemic arterial circulation, including hepatic artery.[2,3] Hepatic rSO_2 are usually maintained during HD without IDH and food ingestion.[4] In addition, the deterioration of hepatic oxygenation would precede IDH onset during HD.[5] However, investigations of the influence of intradialytic food ingestion to the change in hepatic oxygenation has been limited. In this case, deterioration of hepatic oxygenation in response to food ingestion during HD were confirmed prior to the decrease in %ΔBV, and there might be possible two reasons to explain these associations. First, in animal experiments, the increase in oxygen consumption in the blood flowing through the intestine was confirmed in response to food ingestion.[6] Therefore, portal blood into the liver might decrease the oxygen saturation. Second, portal venous blood flow increased and hepatic

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