



The Shortage of Malaysian Stem Cell Ethics in Mainstream Database: a Preliminary Study

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Abstract

Ethics is a philosophical branch of inquiry that reasons between what is right and wrong. The moral philosophy of Socrates, Aristotle, and Plato from ancient Greek became the basis of most of the western ethics. These days, ethics can be divided based on its inquiries for example, normative, descriptive, metaethics, and applied ethics or based on its theories like utilitarianism, emotivism, and universal ethics. In context with applied ethics that examines issues involving emerging technologies, this study will look into the ethics of Malaysian stem cell technology based on written literature. It was mainly to identify Malaysian literature on stem cell ethics through conventional search since the mainstream international database indicated an obvious shortage. The critical review of this literature will facilitate in the understanding of unique position of Malaysia towards stem cell and its ethics in reference to the limited number. Despite the limitation, this can be a preliminary study urging for more inquiries and exploration to fulfil the multiple perspectives in ethics such as the diversity of Malaysian ethics, the impact of ethics in stem cell regulation in Malaysia, and if western contemporary ethics influences Malaysian ethics particularly involving stem cell technology.

Keywords Stem cell technology · Ethical perspective · Relativism · Universalism · Religious ethics · Islamic ethics

Introduction

Ethics is a study of moral philosophy that draws logical reasoning from ethical and moral principle concerning a person's right and wrong either thought or behavior (Mackinnon 2004; Deigh 2010). It also governs and nurtures positive behaviors among societies (Deigh 2010). The word ethics is said to have originated from the Greek word

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“*ethikos*” which means habit or character. “*Ethikos*” itself was derived from the Greek word “*ethos*” which means habituated character or customs. Over time, the meaning of these words began changing even among the Greeks and soon ethics is defined as “custom or character.” However, Aristotle (384-322 B.C.E) is said to be one of the first moral philosophers who related the terms “*ethikos*” and “*ethos*” in his attempt to propose living the right way. (Parry 2014; Heimbach 2015). Aristotle followed in the footsteps of Socrates and Plato in placing virtues as key in a life well-lived, which is also known as virtue ethics. He regards ethical theory as something completely different from theoretical sciences and builds on logic that draws from naturalism and self-realization. Most of the earliest ethical principles were based on western philosophy and often identified Plato and Aristotle as the founding fathers with a key role in its development (Tessitore 1996; Parry 2014; Kraut 2017;).

While the term “*ethos*” gave rise to ethics, when translated in Latin, it gives us “*mos*” or “*mores*” (pl.) which eventually resulted in the English word morals (Lovin 2011). Although contemporary philosophers would describe ethics as critical thinking concerning life, and morals as the basic principle that compels people of what is right and wrong prior to that critical thinking, according to Robin Lovin (2011), the two terms are interchangeable characterized by either their Greek or Latin translations. While the two terms may be used interchangeably but ethics and moral are not the same. Ethics signifies logical and practical standards of right and wrong conceived based on “rights, obligation and benefits to society, and fairness or specific virtues.” It represents the “study and development of one’s ethical standard” to promote fairness within social or business relations (Jenkins 2003). Moral refers to a specific code of conduct that is personal or based on religious faith that is rather abstract and subjective (Gert and Gert 2017). Therefore, ethics can have a contextual definition that is slightly different depending on the aspect in which it is applied such as ethics in environment, business, research, and media.

Types of Ethics

The subject of ethics has a long-standing history involving many civilizations and many centuries ago, starting with ancient Greek to the Medieval times and all the way to the modern contemporary ethics. The famous Greek poet Sappho (637-577 B.C.E) was known for her “pre-philosophical” poetry that explored ethics to some degree (Blevins 2008). Socrates (469-399 B.C.E) never wrote any of his thoughts down but inspired students such as Plato (427-347 B.C.E) and Aristotle to continue his dialogue, documenting them while writing their own significant ethics like Apology, Euthyphro, Eudemian Ethics and Nicomachean Ethics (Kraut 2017; Woodruff 2016). Hindu and Islamic civilizations have equally written different perspectives of ethics in their ancient scriptures such as *purusarthas* and *Qur’an* (Hindery 1978; Quigley 2007). Presently, scholars are persuaded to divide ethics into four main branches that each attempts to confront different aspects of ethics, such as metaethics, descriptive ethics, normative ethics, and applied ethics (Fieser 2009; Vincent Icheku 2011). According to Cram101 (2016), each of the four branches of ethics are different responding to specific questions such as:

Descriptive ethics: what do people think is right?

Metaethics: what does “right” even mean?

Normative ethics: how should people act?

Applied ethics: how do we take moral knowledge and put it into practice?

The four branches of ethics can be further divided into many sub-fields of study depending on the inquiry, among which are virtue ethics (reasoning based on the basic character of someone instead of their actions or consequences), Hedonism (ethics that draws its logic based on “maximizing pleasure and minimizing pain”), consequentialism (ethics that reasons the morality of an action which relies on its outcome or end result), utilitarianism (ethics that denotes right action based on its ability to maximize happiness and minimized pain or based on the most happiness for maximum number of people), emotivism (that ethics reasonings are mostly meant to express emotion and someone’s attitude including compelling a change in that attitude or action), and comparative ethics (involving a comparison of ethical system such as the current and the past, between society and the ethics that most claim to follow, and the actual code of conduct) (Cram101 2016; Mastin 2009). Western ethicists such as Immanuel Kant, Jeremy Bentham, David Hume, John Stuart Mills, and Thomas Hobbes are famous for their contribution in ethical theories that enabled a deep understanding of ethics that is used even today. Modern day philosophers explore and justify emerging technologies, concerns, or issues thoroughly using these theories and continue to impact ethical philosophy by introducing contemporary ethics. With a plethora of ethics, this study hopes to contribute an understanding concerning ethics of stem cell technology in Malaysia that currently is limited in its inquiry.

Ethical Inquiry–Stem Cell Technology

Stem cell technology is a technology that one day hopes to treat, if not cure diseases or conditions that stems from human body’s limited regenerative ability, depending on its potential. Stem cell are unique cells that are not only undifferentiated but with self-renewal ability (regeneration). Among the many types of stem cell, pluripotent stem cells are considered as master cells as they contain all three germ layers needed to make any cells and tissue that a body needs to heal itself and are found abundantly in embryos (Thomson et al. 1998; Shand et al. 2012). The fact that pluripotent stem cells are extracted from embryos or blastocyst (5–14-day-old embryos) that incidentally led to their destruction, makes them one of the most controversial and highly debated topics. While adult stem cells are often identified as the ethical alternative of stem cell without any implication to embryos, they are multipotent with somewhat limited self-renewal and differentiation capacity compared to that of pluripotent stem cell. Being extracted from slightly differentiated cells such as umbilical cord, fetal tissue, adult stem cell (hematopoietic, peripheral, mesenchymal, etc.) can only differentiate to one or two types of cells, limiting their therapeutic potential (Aggarwal and Pittenger 2005; Pittenger et al. 1999).

While the ethical and moral discernment itself is wide, the subject ethics can be broad or focused to understand something specific. Generally, the broad understanding includes various areas such as medical, law, anthropology, economics, sociology, as well as the ethical philosophy at its core. However, based on a narrower construal, it can simply focus on specific field such as medical ethics that compel analysis of scientific pursuits and discoveries in the field of medicine (Benatar 2006). This brings us to the focus of this study which is applied ethics, in association of moral conduct of

stem cell technology. There are many ethical debates and moral controversies involving various scientific and medical discoveries that are documented over the years, enabling understanding of those technologies and their need for the betterment of mankind, which includes stem cell technology. These inquiries either support or oppose a specific aspect of the stem cell technology like the destruction of embryos in human embryonic stem cell research or the human cloning technology in respect to creating more embryos for research purpose. They also justified these subjects based on a range of diverse perspectives or ethical principles such as religious, Kant's utilitarianism, deontology, and universal ethics. A keyword search through a mainstream international database like Web of Science (WoS) on the ethics of stem cell technology in Malaysia for the purpose of identifying the ethical concerns involving stem cell, raised a few key questions that needed some clarification. "Has the ethics of stem cell technology received significant attention in Malaysia?" "What are the ethical concerns highlighted involving stem cell technology in a small Asian country like Malaysia?"

The human embryonic stem cell extraction that destroys the embryos is one of the most controversial issue that received attention among many scholars over the years. Richard M. Doerflinger confronted the embryo destruction from a religious perspective, declaring that the act is not compatible with the Catholic moral principle focusing on the raising concerns of the moral status of the human embryo and the implication of research that involves human embryos (Doerflinger 1999). Anne McLaren called on the moral value of human embryos justifying its potential as a human person and highlighted the excess in vitro embryos (IVF) and embryos created for research purpose via somatic cell nuclear transfer (SCNT) as possible alternatives to retrieving human embryonic stem cell (McLaren 2001). In 2004, Donald W. Landry and Howard A. Zucker wrote an interesting piece that focused on the issue of embryonic destruction and the United States (US) Congress's action on banning federal funds for the use of human embryonic stem cell research. According to Landry and Zucker, since about 60% of IVF embryos fail to meet the viability criteria rendering them non-viable leading to their disposal, these embryos are not completely dead and can have normal blastomere from which stem cells are extracted from making them a great source of embryonic cells (Landry and Zucker 2004). Studies by Svetlana Gavrilov et al. (2009; 2011) and Mehta (2014) proved the feasibility of deriving stem cell from non-viable embryos making them possible options (Gavrilov et al. 2009; Gavrilov et al. 2011; Mehta 2014).

The debate relating to the human embryo destruction has led to the adoption of 14-day rule that enables human embryonic stem cell research on excess IVF embryos based on the justification of "when life begins" and the point of sentience of the embryos which often marks gastrulation that includes brain development after 14 days. However, in Germany, the human integrity of the embryos is greatly protected under the Embryo Protection Act (*Embryonenschutzgesetz*) 1991, and the importation of embryonic stem cell is only permitted under the strict regulation of the *Stammzellgesetz* or Stem Cell Act 2002 (Bundestag of Republic of Germany 2017). Since stem cell research is popular involving countries around the world, the revolutionary and experimental studies involving stem cell are becoming widely accessible particularly in countries with relaxed or no regulation such as Thailand and China. This compel

tourists from countries where stem cell therapies are strictly regulated or are not easily accessible, to travel to the countries where unproven stem cell therapies are marketed resulting in a phenomenon known as stem cell tourism (Sipp et al. 2017). The high cost and the questionable procedures leave these vulnerable patients exploited and victimized, not to mention the issue of risk and safety aspects that the illicit providers often neglect (Brown 2012; Einsiedel and Adamson 2012). The ethical concerns involving stem cell tourism calls on effective regulation to curb or minimize the ethical issues and misconducts (McMahon and Thorsteinsdóttir 2010; Cohen and Cohen 2010; Einsiedel and Adamson 2012).

While there are substantial number of literature written on the ethics of stem cell technology that are popular with extensive discussion, the limited literature written by authors from Malaysia (based on international database search), questions if its countrymen do not share the view or if their concerns involving stem cell are placed elsewhere and not worthy of international publication. With that, this study aims to identify the stem cell ethics literature written by Malaysian authors and review them to understand the concerns and perspectives.

Methodology

This is a qualitative study that focuses on the ethics of stem cell technology that is primarily based on written literature. Since the main query is stem cell ethics by Malaysian authors, searching through mainstream, international database such as WoS and SCOPUS, proved unsuccessful with only one or two identified for the period between 1990 and 2016, which is one of the reasons why this study was deemed necessary. Therefore, a search through all unconventional databases and basic search engine such as Google Scholar and Google was necessary to identify more literature enabling somewhat a thorough review. Prior to the final analysis, each of the literature was subjected to the questions, “does the literature discuss the ethical concern of stem cell technology?” and “are they written by Malaysian author?” to ensure they are relevant to this study. Although, the criteria are rather straightforward, any literature written by Malaysian authors based in international universities will not be included in this study regardless of their relevance which is identified as the limitation of this study. The resulting Malaysian literature was reviewed critically to identify the ethical perspective of the written literature based on several criteria listed in Table 1 to help classify them into a specific perspective or type of ethics, based on their definition.

Studies such as has Cottone and Claus (2000) and Klaus Hoeyer (2008) have proven that critical review on variety of topics can be important with significant findings. According to Xiao and Watson (2019), critical reviews help built a “foundation of academic inquiries” similar to the aim of this study in the aspect of stem cell technology. While scientific research depends on validity and reliability, in qualitative study such as this, the robust and unbiased method and research design add to its scientific rigor. Although the search incorporated were manually searched, that may have left out some important studies, it is considered a reliable study as it has included sufficient number of samples enabling a thorough analysis (Xiao and Watson 2019).

Table 1 Criteria to classify stem cell ethics literature

Ethical inquiry	Morality	Ethical perspective
1. Ethics on stem cell research or its therapy, which includes but not limited to moral status of embryo, personhood theory, public perception, and future consideration ¹ .	Based on universal or generalized norms, values, or concepts that apply to everyone, regardless of the culture, religion, or region (Kohfeldt and Grabe 2014).	Ethical universalism
	Based on the theory that morality is relative to one's cultural norms and its religion, without absolutism (Baghranian and Adam Carter 2018).	Ethical relativism
2. The issue of public policy and regulation concerning stem cell technology ¹ .	Based on the theory that morality is relative to a country, society, and culture, without absolutism (Baghranian and Adam Carter 2018).	
	Based on universal or generalized global norms, that applies to everyone, regardless of the country, society, and culture (Kohfeldt and Grabe 2014).	Ethical universalism

Result and Finding

Stem Cell Ethics-Malaysia

This study began as an attempt to identify the literature on ethical concerns of stem cell technology authored by Malaysians, especially due to its shortage judging by a search in international database. Although several international articles written by western scholars such as Sipp et al. (2017); Sipp (2011); Sleeboom-Faulkner et al. (2016); Einsiedel and Adamson (2012); Berger et al. (2016) have all mentioned Malaysia at some point in their article examining issues like stem cell tourism and unproven stem cell therapies, their assessment was not specifically focused on Malaysia or its ethical basis. It was necessary to document the reason behind the shortage involving stem cell ethics by Malaysian-based authors is (as searched in WoS) not because Malaysian scholars are not interested or invested in ethical inquiry involving stem cell technology because there is evident of such literature authored by them published locally. The search through Google Scholar and Google demonstrated that a total of 19 literatures which include book, book chapter, journal article, newspaper article, and conference proceeding for the period between 2000 and 2016 that Malaysians have authored on stem cell ethics. Although two Malaysian articles were published by international journal and were identified through WoS search, they are not the only literature concerning stem cell ethics. Among the Malaysian stem cell ethics, there are many concerns and perspective that are not only unique to Malaysia but also very delicate and personal owing to its religiously diversity.

One of the earliest literature was by Majeed (2002) (see appendix) discussing the ethical and legal concerns of biotechnology revolution, which was published as a book chapter by the Islamic Institute of Understanding Malaysia also known as *Institut*

Kefahaman Islam Malaysia (IKIM). Although the main highlight was biotechnology, it included embryonic research and stem cell in its query, exploring them from a religious perspective. The study by Majeed can be considered as one of the earliest works on the ethics of stem cell in Malaysia. Soon, Nordin (2004) (see appendix) followed suit having his article published as a book chapter by IKIM, that also discussed issues involving emerging biotechnology innovation, emphasizing the strong influence of Islamic *Shariah* (please refer to Davidson (2013) for more information on Islamic ethics & *Shariah*) in bioethical debates. Between Majeed and Nordin, Nordin delved into deep Islamic principle and practices, especially Islamic *Shariah* to justify their sufficiency as a biotechnology jurisprudence that is considered as the essence of Islamic way of life. The two initial articles by Majeed and Nordin that documented the religious enquiry of stem cell research ethics clearly hold precedence among Malaysia and are consistent with the ethical relativism perspective that is relative to the Muslim population in Malaysia.

Unlike Majeed and Nordin, several articles published soon after, examined various stem cell-related issues such as the use of surplus embryos in human embryonic stem cell research, the present and future stem cell transplantation in Malaysia, and the ethical consideration of stem cell therapy specifically in orthopedics surgery. All of which were from a universal viewpoint being clustered in as ethical universalism (Islam et al. 2005; Fadilah et al. 2008; Hui et al. 2009). Although the two latter studies are general inquiries highlighting the ethical standards and protocol concerning stem cell transplantation, also known as therapy, the study by Islam et al. (2005) (see appendix) addressed the use of surplus human embryo identified international policy option that is founded on the basis of the medical ethics and the four principle by Tom Beauchamp and James Childress which are autonomy, beneficence, non-maleficence and justice, to ensure the ethical use of embryos in human embryonic stem cell research. This is one of the very first studies that examined stem cell ethics issue using a western bioethical principle like Beauchamp and Childress in Malaysia.

In 2009, Majeed (see appendix) wrote a book titled, “To clone or not to clone...and other ethical issues in pharmacy and medicine” which he began by introducing the aspect of cloning as discovered by Ian Wilmut and Keith Campbell and the birth of baby Louise Brown, and slowly presented the various ethical theories such as deontology, utilitarianism, virtue ethics, secular ethics, and religious ethics (Judeo-Christian, Islamic, Christian) . On page 31, Majeed focused on the issue of stem cell research from an international perspective by looking explicitly on the practices of that in the USA. However, he delved into Islamic ethics explaining the ensoulment process in Islam that only happens at 120th day after conception justifying the use of 14-day or younger embryos in research including in human embryonic stem cell research (Majeed 2009). Although the 14-day rule supports the Islamic view, the rule is staple in the governance of embryo-based research and is attributed to two major reports which are (1) the 1979 report of the Ethics Advisory Board to the Department of Health, Education and Welfare (HEW), and (2) the 1984 Warnock Report by the Warnock Committee of Inquiry into Human Fertilisation and Embryology (Pera 2017).

Since Malaysia’s first stem cell transplantation in 1987, the multi-religious population became a focus in a study by Foong (2011) (see appendix) that examined human

embryonic stem cell research against the multi-faith people such as Islam, Buddhism, Christianity, Hinduism, and Sikhism, a study that is first of its kind in Malaysia (Gan et al. 2008). The use of embryos in human embryonic stem cell research is often founded on the basis of the “ensoulment process” especially in Islam, Christianity, and Catholicism, whereby it is customary that the identification of “when life begins” determines if and when embryonic research can be justified. The article indicated that the National *Fatwa* Council, a body that advises the Muslim people regarding their practices that should be in harmony with the Islamic law, only recognizes stem cell and allows its progression but disapprove IVF and SCNT used for creating embryos for research purpose. However, according to Foong, the National *Fatwa* Council may eventually include embryos created through IVF and SCNT technology for research as it does not go against their beliefs (Foong 2011). The article examined the different religions and reported that while the Catholics oppose human embryonic stem cell research, Buddhists and Hindus permit it based on their idea of alleviating human suffering. Thus far, in Malaysia, there has been no clear documentation on the position of cloning for Hinduism, Buddhism and Sikhism but Foong believes these religion needs more deliberation to establish an official position concerning the matter.

Following suit, Sivaraman and Noor (2014, 2015) (see appendix) also gave focus on the multi-religious aspect of Malaysia in their attempt to validate the use of human embryos in human embryonic stem cell research. Their writing was published in “Science and Engineering Ethics,” an international journal that was identified during the WoS database search, making them highly valuable with international recognition. The articles, both documented human embryonic stem cell but was invested in religious ethics focusing on Islam, Hindu, Buddhist, and Catholic, very similar to the study by Foong (2011). The perspective of different religions on the issue of human embryonic stem cell is rather exceptional with the multi-religious population of its people. These are enquiries that fit the ethical relativism category regardless of its examination of more than one religion and their practices mainly with its discussion being relative to religious beliefs and principle.

The Islamic perspective on human embryonic stem cell is not exclusively unique to Malaysia; its religious support based on the concept of ensoulment is well documented with distinctive variation on their timing like 40th, 42nd, and 120th day (Jackson 2014). According to Majeed (2009) (see appendix) and Foong (2011), Malaysia follows the 120th day based on its Islamic practice that justifies human embryonic stem cell research and stem cell technology based on the 14-day rule adopted globally. The rule was originally recommended in 1979 by the Ethics Advisory Board for the Department of Health, Education, and Welfare (HEW) to direct the growth of any human embryo grown in vitro for research purpose to be ceased at 14-day post-fertilization or at the point of “primitive streak” formation, whichever happens first. In 1984, the 14-day rule was endorsed by the UK Committee of the Inquiry into Human Fertilisation and Embryology (“Warnock Committee”) in their report known as “Warnock Report.” To date, there are close to 12 countries around the world, including the USA, UK, Canada, India, Singapore, and China, that have adopted the restriction as a law or guideline (Kimmelman et al. 2016). Malaysia has also incorporated the rule in its stem cell guideline, not exclusively reflective of its Islamic belief, but to incorporate the other religious perspectives in Malaysia, as done globally (Ministry of Health 2009).

On the topic of ensoulment, the two main denominations in Islam, known as *Shia* and *Sunni*, denote the significant difference in timing. They emerged following the death of prophet Muhammad over the dispute of his succession. The *Sunni* or “People of the Tradition” that makes up 85% of the world’s Muslim population, is based on what the prophet did, agreed, or condemned which is also divided based on their guiding school of jurisprudence, such as *Hanafi*, *Hanbali*, *Maliki*, and the *Shafi’i*. The *Shia* are divided into three groups, the *Zaidis*, *Ismailis*, and *Ithna Asharis (Twelvers or Imamis)*, and make up 15% of the world’s Muslim population. Although all Muslims accept the *Qur’an* as divine and a revelation of *Allah*, their opinion concerning *hadith* (oral and written practices described by Muhammad based on *Qur’an*) separates *Sunni* and *Shia*, whereby their varied acceptance of the *hadiths* denotes their differences. Malaysia is said to follow the ideology of the *Shafi’i* school of jurisprudence of *Shia*, and one of the most followed for *Shariah*, which is predominantly found in South East Asia and accepts the 120th day for its timing concerning ensoulment (Jackson 2014). This also explains the thorough writing by Nordin (2004) (see appendix) concerning the foundation of *Shariah* in Islamic bioethics as seen in Malaysia and Foong’s (2011) (see appendix) explanation of *Shariah*’s authority in legal system especially concerning Islamic aspects.

Since then, there have been regular publication on the topic of stem cell, one of which includes a study by Amin and her colleagues which incorporated Islamic ethics while exploring the intensity of local newspapers in Malaysia focusing on the ethics of biotechnology, particularly with the government’s emphasis for the need and investment of the technology (Amin et al. 2011). Foong (2012) (see appendix) is an article on human embryonic stem cell, but from a regulatory perspective, recommending Braithwaite’s theory of responsiveness to better regulate the technology in Malaysia giving the Guideline for Stem Cell Research and Therapy (2009) some significance. Based on the theory, it is necessary to consider multiple stakeholders and deliberate for responsive choices based on a pyramid system that incorporates both punishment and reward system as means to control ethical conduct of human embryonic stem cell research. However, the multi-religious aspect of Malaysia was still a basis of this study. In 2013, Majeed revisited the topic of cloning in his article “When cloning benefits mankind” published in IKIM, which explored the issue based on the Islamic beliefs validating the religious contradiction on some aspect of cloning such as somatic cell nuclear transfer (SCNT) but not stem cell (Majeed 2013).

There have been other areas of study (other than ethics or philosophy) that addressed the subject of stem cell technology in Malaysia. Abdul Ghani Azmi and Zawawi (2015) (see appendix) investigated the patentability of biotechnology innovations focusing particularly on the innovations that emerge from human embryonic stem cell research. The paper proposed that Malaysia follows the patentability practices of that in the UK and Europe whom have integrated ethics and morality as factors to determine the patentability of these types of innovations in their countries. The authors suggested the Islamic ethics in Malaysia as a criteria to consider for its own biotechnology patentability (Abdul Ghani Azmi and Zawawi 2015). A study by Majeed (2015), entitled “Research Ethics: Sharing or Scarring” questioned the motivation of research ethics, either

to share or disseminate information to bring about ethical conduct in research or to use bureaucracy and extensive review period into scaring people into ensuring their research integrity and ethical conduct. His presentation did not include any aspect of Islamic ethics as did previously.

The role of religion and religiosity in embryonic stem cell was a study conducted by Amin and Hashim (2015) (see appendix) that examined the impact of religiosity towards Malaysian stakeholder's decision concerning human embryonic stem cell technology. According to Amin and Hashim, in Malaysia where religion is said to play an integral role, religious acceptance does influence stakeholders' perception towards human embryonic stem cell technology, and among 500 over people, the attitude is less positive compared to adult stem cell (Amin and Hashim 2015). A study by Rahman (2015) (see appendix) highlighted the concept of *halal* in stem cell research and therapy. The emphasis of *halal* and *haram* is something every Muslim considers especially choosing what they consume but it can easily include treatments such as stem cell therapy. Although the term *halal* can be defined as "meat prepared as prescribed by the Muslim law, its use can be wider than just the food industry. It can also mean what is permissible from the Islamic perspective and *haram* is what is prohibited. However, Rahman was more concerned about the in-betweens that are much more complicated such as stem cell technology and urged for more exploration on the topic by religious scholars. This followed by a study by Amin and her colleagues (2016) (see appendix) that assessed and compared the attitudes of Malaysian public on the use of human adult stem cell and human embryonic stem cell in treating diseases. The study reported that Malaysian public are concerned about human embryonic stem cell compared to human adult stem cell, and their distress seems to rise just as their level of education, although it was not significantly captured. Catholics are said to be more concern as documented by previous studies (Amin et al. 2016). A similar study by Farahnaz Amini and colleagues (see appendix) in 2016 examined the "knowledge, awareness, and perception of stem cell research" among Malaysian medical students particularly from UCSI and reported that the participants' awareness was not associated with their gender, nationality, race, or even religion (Amini et al. 2016). The study by Lye et al. (2015) (see appendix) examined the relationship between knowledge and attitude among Malaysian undergraduate nursing students and reported their acceptance of the stem cell technology is not reliant on the scientific proofs but on other factors such as religion, culture, and exposure to the technology proving there is weak association between knowledge and attitude.

The public perception of stem cell technology is a wide topic including assessment of specific cluster of people such as students or lay people. Based on the study by Amin et al. (2016), despite being the sole article that investigated public perception between adult stem cell and human embryonic stem cell, it was based on the religious background of the participants. It integrated some religious points into the discussion making it a study is identified as an ethical relativism study. The main discussions of the studies by Amin et al. (2016) and Lye et al. (2015) that addressed the perception of the specific cluster of people (undergraduate medical students and nursing students) were founded based on ethical universalism as their main discussions with some

general arguments with no association to specific culture or religion. The stem cell ethics in Malaysia so far have emphasized religious ethics in particular Islamic ethics judging by the literatures. Among the total of 20, 14 were written based on a religious perspective either focusing on a specific religion like Islamic ethics or exploring multiple religion in the context of ethical consideration of its population which constitutes as a form of ethical relativism, whose arguments are said to have no absolutism especially with various religious beliefs and its practices. As presented in Fig. 1, out of the 14, six were explicitly on the aspect of Islamic ethics and were placed in a dashed circle within the ethical relativism to denote its fluidness which often spills over in any discussion involving religious consideration in Malaysia which includes the remaining nine. Only five of the Malaysian stem cell ethics, highlighted general stem cell related issues without incorporating ethical viewpoint such as Islam et al. (2005) (see appendix), Fadilah et al. (2008) (see appendix), Hui et al. (2009) (see appendix), Lye et al. (2015) (see appendix), Majeed (2015) (see appendix) and Amini et. al (2016) which was classified as the only literature written from the ethical universalism perspective.

Discussion

Although the international database search resulted in only two articles on the topic of stem cell ethics that was authored by Malaysians, it was not because that there were no others but because they were published in Malaysian journals or presented in Malaysian-based conferences that the international database search disregards. The specific inquiry that highlights the pluralistic population of Malaysia and their culture, makes them significant but they are limited. The reviews of these inquiries identified a unique concern involving stem cell technology in Malaysia, based on published literature compared to international, western contemporary articles. While these type of inquiries on stem cell technology are relevant and booming, their focus is largely placed on religious ethics, moreover Islamic ethics. This is imperative as Malaysia is a country with a diverse group of people identified by their ethnicity and religion, but it is a predominantly an Islamic country with Islam as its official religion. Its multi-religious population urge for careful deliberation and consideration involving delicate topic like human embryonic research. (Means 1978; US Commission on International Religious Freedom 2005). Religious inquiries are considered customary in Malaysia to examine the different norms and practices and deciding compromises and balanced conduct relating to technologies and industries. It is an encouraged pursuit to educate others

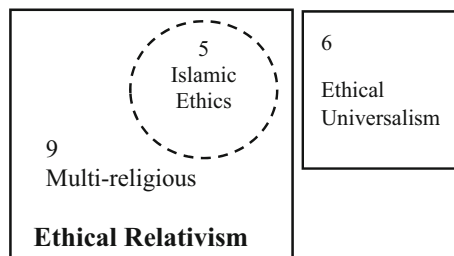


Fig. 1 Perspective of stem cell ethics in Malaysia based on published literature

regarding multi-religious justification and challenges of the intricate legal system involving such country. No doubt there is a shortage of Malaysian stem cell ethics literature based on a search through WoS database. But the shortage did not indicate a lack of interest in the issue, because several literatures that were locally published were identified with noteworthy report. It confirms that Malaysian scholars are concerned about the stem cell technology and have examined some of its aspect, including human embryonic stem cell research and the religious consideration towards to use of human embryos in research. The review of the Malaysian stem cell ethics literature showed that they are explicitly concentrated on religion, (including Islam, Hinduism, and Buddhism) having incorporated them in broad discussions about public perception, ethical issues in media, biotechnology regulation, policy, as well as moral status of embryos.

Religious Ethics vs Stem Cell Ethics

Religious Ethics

While ethics can present a moral guide, resolve conflict, and may not give a single right answer based on logical reasoning, its decision-making is based on various theories and principle ranging from Greek philosophers, western to Islamic religious beliefs. The Oxford dictionary defines religion as, “the belief in and worship of a superhuman controlling power, especially a personal God or gods.” The practice and teaching of right and wrong or good and evil, that is based on religious practices is known as religious ethics (Dobrin 2002). It is not something rare, new, or unheard off. There have been valid studies involving them such as Reeder (1997), Keown (2016), and Fasching et al. (2011). While some argue from religious stimulus, others examine all possible arguments for a more logical interpretation and decision-making. Ethics is said not native to the world’s religion; but inspired by the Greek predecessors, others (either representing their religious group or simply involved in theological research studies) have explored the teaching of ethics within certain religion, proving their basis. The Hindu *Dharmaśāstra*, refers to writings and essays on Hindu *dharma* that denotes behaviors that are said to be in harmony or ethical, dating back to the 1st millennium (Perrett 1998). While in Islam, the Holy *Qur’an*, the *hadith*, and prophet Muhammad’s commands have all introduced ethical virtues or better known as moral norms that shape Muslims of their thought, action, and reflection (Schweiker 2008). It is even said that laws and ethics are connected urging for righteous Islamic living (Manzoor 2005). This signifies the system in Malaysia with Islamic practices being a highly motivating factor in their law and policymaking receiving advices of their national *Fatwa*, an Islamic authority that rules on the point of Islamic laws.

Malaysia is an Asian country in South East Asia, with diverse religion and culture of people living harmoniously due to their compromising and tolerating custom. The Malaysian Constitution, Article 11 stipulates that everyone is granted freedom of religion recognizing Malaysia a secular state and not an Islamic state (Parliament of Malaysia 2010; Sreenevasan 2007). Based on the 2010 chart of the religious distribution in Malaysia (the most up to date), 61.3% of the people are Muslims, 19.8% are Buddhist, 9.8% are Christians, 6.3% are Hindus, and 1.3% are Confucian and Taoism.

There are 0.7% classified as no religion and 0.4% with other religion (folk and others) (Department of Statistics Malaysia 2010). In Malaysia, religion plays a significant role in politics (example: involving government affairs) and legal aspects (religious consent) involving many industries (example: food) and subject areas (example: mix marriages and scientific technology), especially Islamic practices in accordance to their teaching (Department of Statistics Malaysia 2010).

Although religious consideration is a priority and fundamental in any policy or law-making process in Malaysia, especially from an Islamic perspective owing to its majority population and the official religion, however, this study does not capture the perspective of atheist or their opinion regarding stem cell technology. The aspect of atheism is very delicate in Malaysia; many influential political figures have pointed out that such behavior among its Muslim population is punishable based on *Shariah* or the Islamic law (Shagar 2017; Lim 2017). Hence, it is important to acknowledge that the aspect of atheism will not be reflective in this study due to its delicate nature. The Islamic consideration towards the use of human embryos in stem cell research was sought first from the Malaysian *Fatwa* Committee in 2005, 4 years before the guideline was published in 2009. It was based on the discussion of the 66th meeting of the Malaysian National Council for Islamic Affairs to address the issue of therapeutic cloning and assisted reproductive technology (ART). The Malaysian Consultative Council of Buddhism, Christianity, Hinduism, Sikhism and Taoism (MCCBCHST) was also approached during the stem cell guideline formulation offering representation regarding religious matters whenever necessary. Such religious consideration is virtually a putative compromise that most population agree upon, which ensembles a degree of religious inclusiveness at its best, considering the circumstances that there is no absolutism when religions are involved. The incorporation of the 14-day rule (regarding the human embryonic stem cell research) in the Malaysian Guideline for Stem Cell Research and Therapy (2009) is therefore a compromise as agreed upon globally and demonstrates a sense of inclusiveness and not of Malaysia's Islamic belief or perspective specifically.

Stem Cell Ethics–Malaysia

The review of the ethical issues involving stem cell technology demonstrated various concerns that are important and require careful examination. While the central issue revolved around the permissibility of human embryonic stem cell research concentrating on the moral status of the embryos, both Malaysian and western contemporary stem cell ethics incorporated ethical universalism as well as ethical relativism arguments. While ethical relativism arguments can be relative to ethnicity, culture, religion, and country, the ethical universalism especially in the context of moral status of embryo can be on the basis of science or generally what constitutes as moral or dutiful. In a multi-religious country like Malaysia with predominantly Muslim population and Islam as its official religion, the human embryonic stem cell is successfully supported not by Islamic ethics (religious ethics) alone but also by universal ethics. However, the justification of the human embryonic stem cell research from the Hindu and Buddhist perspective is rather different, unlike those involving Islam, Catholic,

or Christianity whose justification revolves around the “ensoulment” process which either denies or warrants the embryos of its moral status. Both Hinduism and Buddhism encourage compassion and non-violence (*ahimsa*) but based on *prajñā* coinciding with seeking knowledge and reasoning and in the pursuit to alleviate human suffering, upholding the “ends justifies the means” viewpoint (Knowles 2009; Sivaraman and Noor 2014). Any confrontation with a Hindu or Buddhist religious expert concerning the human embryonic stem cell or the moral status of embryos for research purpose would not result in an explicit position of support or against, as both positions have its own vindication, and it is the priority (or significance) that often assists in the decision-making. Whereby in the case of human embryonic stem cell research that may provide therapeutic discovery alleviating human suffering, easily takes precedence over the sacrifice of several IVF embryos that may or may not fulfil personhood.

Although the debate regarding the moral status of embryos itself is wide, there are many other inquiries that involved various aspect of ethics, such as the ethical procurement of stem cell, ethical approvals for clinical trials involving human subject, ethical distribution of therapy, the ethics involving matters of informed consent, policy, and regulation. Equally, these areas of stem cell ethics can be examined from an ethical universalism perspective or relative to the practice of different country or culture. The Malaysian literature on stem cell ethics has demonstrated somewhat diverse issues, ranging from moral status to the perception of public or specific group of people towards stem cell technology. While human embryonic stem cell research is popular due to its controversy and delicacy, it was assessed from various perspectives (multireligious, Islamic ethics, and universal) enabling a thorough review. The public perception subject was only investigated by three studies (Amin et al. 2016; Amin et al. 2016; Lye et al. 2015) involving different cluster of people and is insufficient to draw up any kind of theory. But the noteworthy point is that three studies proved that religion and culture continued to play a significant role on the participants’ perception towards stem cell technology despite their position, level of education, and scientific training. A study by Matthew C. Nisbet (2004) on public perception in the USA reported that with the limited media coverage on the issue involving stem cell technology, the public should not be blamed for lack of knowledge. His article reviewed public perception survey conducted beginning 2000 (before George Bush became US President) up to 2002 (after George Bush became US President and had his first national televised address), indicated lack of knowledge among public prior to the televised address. After the address, a survey showed about 50 to 60% of participants showing support towards Bush’s action refusing federal funds for the creation of new embryonic stem cell lines. In countries that engage representation from the public during policy and other regulative decision-making, including in the USA, people’s lack of knowledge in a specific area or issue may leave the process unproductive. It is also hard to deny that their assessment and opinion may be influenced by religious or cultural upbringing, as is often the case in Malaysia.

A majority of the identified Malaysian studies stemmed from a religious viewpoint either exclusively on Islamic ethics or that investigated a few

religions at once. International articles on stem cell ethics documented similar issues examining the moral status of human embryos that are unintentionally destroyed during stem cell extraction. Some of them reported the need for governance to minimize exploitation involving such delicate technology which laws and regulatory policy can provide ensuring the ethical conduct. Although the enquiries were diverse, most of these discussions stemmed from a universal perspective. While some examined the practices involving stem cell technology in the USA, United Kingdom (UK), Germany, some introduced theories such as the idea of “personhood” or “sentience” into the debate using scientific analogy like gastrulation, which is the point of primitive streak formation indicating formation of brain and its activities. The Malaysian stem cell ethics has enormous amount of inquiry needing examination and documentation, for example the influence or relevance of western ethical principle in Malaysian stem cell ethics and regulative decision-making.

Having said that, religious ethics does play an important role in Malaysian stem cell ethics and its regulation, especially since the original Guideline on Stem Cell Research (2006) was formulated after the deliberating committee consulted the Malaysian national *Fatwa* to ensure stem cell technology is religiously permitted, specifically in Islam (Ministry of Health 2006). The revised Guideline for Stem Cell Research and Therapy (2009) compelled for the religious consideration of other religion in Malaysia such as Hinduism, Buddhism, Taoism, Sikhism, Catholicism, and Christianity by approaching MCCBCHST, capturing the position and value of religion in ethical and policy-based decision-making (Ministry of Health 2009). However, the stem cell guideline formulation committee stated that while the *Fatwa*’s approval on stem cell (specifically human embryonic stem cell) research was rather clear and forthright, the other religious consideration, based on their religious experts turned out inconclusive with the discussion turning askew without reaching any consensus. The study by Sivaraman and Noor (2014, 2015) and Williams Neaves (2017), revealed that Catholics (not only in Malaysia) oppose human embryonic stem cell based on their teachings that life begins at conception and is inviolable, making the 14-day rule fallacious. It goes to suggest that the committee may have had difficulty reaching consensus and found middle ground in the use of the 14-day rule within the guideline just as other did globally.

Even though the religious review and consideration were rather lengthy and challenging, the committee assured it was a necessary step in the guideline formulation (Foong 2011; Sivaraman and Noor 2015; Gopalan et al. 2019). Therefore, the stem cell guideline is considered as the likely compromise between different religious background, reached after careful deliberation concerning stem cell technology in Malaysia. In western countries like the USA, religion did play a role in their decision-making concerning human embryonic stem cell research especially during the former president Bush’s administration. Being a Christian, his advisors (including the President’s Council of Bioethics) recommended that no federal funds will be allocated for human embryonic stem cell and only those existing cell lines will be allowed, prohibiting the creation of new human embryonic stem cell lines. However, when Barrack Obama took office, he relaxed the restrictions enabling more research in the area. Therefore, the incorporation of religion or its emphasis

depends on the ruling party or government and their faith, as in the USA. It is a practice common in the west but under no circumstances will reflect the practices in countries with pluralistic population that will always bring religious consideration into law and policymaking, regardless of administrative changes because it is a part of their constitution such as Indonesia, Singapore, and India.

The religious consideration and the challenges of reaching consensus involving many religions may inadvertently impede any policy interoperability of the technology. Any effort towards harmonizing stem cell laws and policies in the world (with many religions) will be impossible especially in reaching consensus. This is evident based on the formulation of the stem cell guideline in Malaysia that does not exclusively portray the opposing position of Catholics in Malaysia (or globally) (Gopalan et al. 2019). Although, the religious factor in Malaysia is an imperative regulative procedure, but it become askew when collaborative efforts with other countries are involved. Liberal stance on embryonic research or cloning (therapeutic) in some countries like China, Singapore, and Japan can raise question concerning the source of the human embryonic stem cell used in their joint-venture with Malaysian researchers and the ethical guideline involving such collaborations with restrictive countries. Currently, the Declaration of Helsinki and United Nation's Declaration of Human Cloning are two international documents regarding human experimentation and cloning respectively. But while the former is not legally binding, Malaysia's abstinence in signing the Declaration of Human Cloning questions its position implying a flexible practice concerning human cloning in Malaysia. However, the religious consideration has resulted in prohibition of human cloning in Malaysian as stipulated in stem cell guideline. While this indicates Malaysia's rather lax position in the absence of law or policy, there are some countries that have completely banned human embryonic stem cell such as Germany (that respects human dignity), Italy, and Austria (religious perspective). Some countries allow embryo-based research (including stem cell and ART) either by regulating them tightly such as the UK, Australia, or partially like the USA (based on their state laws). Such country specific laws actually represent a range of position and beliefs that may question the possibility of an international harmonization of laws particular with international collaboration efforts. Professional code of ethics is essential, providing guidance to researchers, physicians, and healthcare providers to preserve "professional integrity and ethical soundness" but from a Malaysian perspective, it may never stand-alone without any association to religion as it is a significant factor in policy and law-making (Means 1978; Scanlon 2000).

The issue involving collaboration have raised valid concern especially since the unique ethical position involving countries in the world will never result in a single absolute standard, inhibiting any effort to harmonize the laws and policy of SC technology to ensure they are bound by consistent conduct. This is a perfect example of how ethical relativism refutes ethical absolutism concerning regulating stem cell collaborations. Although, ethical absolutism is not necessary to reach consensus but with such varying degree of positions, possible compromises may not be feasible.

Conclusion

This study began as an effort to identify the stem cell ethics based on written literature by Malaysian-based author, especially since a search through WoS database resulted in only two articles. It sparked a need to expand the search to prove that the limitation has its reasons that needs documentation guiding others learning the subject of stem cell ethics in Malaysia. This study proved that majority of the relevant literature were published locally with a deep inquiry involving religion. These include multi-religious consideration of human embryonic stem cell research and the Islamic ethics perspective regarding the use of human embryos for research. Although Malaysian-based literature confirmed that there are concerns regarding stem cell technology in Malaysia, their local publication presumably indicates a rather national affair than international, especially concerning religious exploration.

Despite being published within Malaysian journals or presented in Malaysian-based conferences, the Malaysian stem cell ethics literature disclosed valid concerns that urge for progressive religious discussion in its aim towards effective decision-making involving many areas of stem cell technology such as research practices and regulation (which includes policy and law-making). While Malaysia's ethics appears to be religiously inclined, its religious consideration balances between Islamic ethics and religious inclusiveness to some degree. This is common in a pluralistic country like Malaysia with Muslims, Buddhists, Hindus, Taoism, Sikhs, Christians, and Catholics. The religious consideration may have risen from the issue of embryo use in human embryonic stem cell research, but the impact is greatly significant as it facilitated in the formulation of the guideline and regulation of the technology in Malaysia. The religious ethics or Islamic ethics is not explicitly unique to Malaysia, but its effort in reaching religious compromise through inclusive consideration may be.

With that, it is normal and customary that the ethics of stem cell technology becomes the basis of its regulation and policy or law-making. There are countries that have tightly regulated the technology due to their traditional perspective and those with completely liberal policies with no restrictions. Although Malaysia's stem cell technology is neither liberal nor tightly regulated, its ethical relativism may impede any effort to harmonize world's stem cell laws and policy to bring about policy interoperability. While such effort would regulate international collaboration of stem cell-related projects with countries of different regulatory positions, bestowing some consistency, however, ethical relativism based on one's culture will under no circumstances foster the effort. The country-specific regulations (that is based on their very own ethical relativism) will not only create some form of conflict of interest but bring about religious incompatibility that is very critical in a country that emphasizes religious aspect like Malaysia. Therefore, more studies are needed to facilitate the understanding of not only the delicate matter of religious ethics (including Islamic ethics) pertaining to human embryonic stem cell research and emerging technologies, but to address the various subject matter involving stem cell technology in Malaysia and its relevance to global practices. By publishing these unique inquiries in international journals (either as special issue or invited comments) will enable them to reach larger population through the international mainframes initiating further exploration.

APPENDIX

Table 2 Malaysian Stem Cell Ethics Literature

Author	Title	Journal	Brief Summary	Focus Area	E t h i c a l Perspective	Morality
Abu Bakar Abdul Majeed (2002)	'Genetics' – Integrating ethical reasoning and scientific findings	Islamic Institute of Understanding [Book Chapter]	Discussed the many ethical and legal issues raised by the "biotech" revolution, including stem cell.	Biotechnology Awareness	Ethical Relativism	Religious Ethics
Nordin, M.M. (2004)	Islamic Medical Ethics Amidst Developing Biotechnologies	Islamic Institute of Understanding [Book Chapter]	Discussed the Islamic medical ethics concerning biotechnology development including stem cell and identified the Islamic Syariah principle as standard for its formulation.	Islamic Syariah principles involving biotechnology innovation including stem cell.	Ethical Relativism	Religious Ethics [Islamic Ethics]
Islam, S., Nordin, R., Ab Rani, S., & Mohd Nor, S. (2005)	Spare embryos and human embryonic stem cell research: ethics of different public policies in the western world.	The International Medical Journal Malaysia [Article]	Identified major policy options which are adopted by the Western world such as the bioethical principles (autonomy, beneficence, non-maleficence & justice) to ensure they are ethically sound to deal with biomedical issues.	Multiview of HESC	Ethical Universalism	Universal Values
Fadilah, Leong & Cheong (2008)	Stem cell transplantation in Malaysia and future directions.	Medical Journal of Malaysia [Editorial Comment]	Highlighted stem cell transplantation from the beginning and its future direction in Malaysia.	Future direction of stem cell	Ethical Universalism	Universal Values
JHP, Hui., M. Azura., & EH, Lee. (2009)	Stem cell therapy in orthopedics surgery: current status and ethical considerations.	Malaysian Orthopedic Journal [Article]	Offered a brief summary of the current status of stem cell research with emphasis on the clinical application of stem cell therapy, focusing on the issue of ethics.	Feasibility of stem cell in orthopedic medicine	Ethical Universalism	Universal Values
Abu Bakar Abdul Majeed (2009)	Too clone or not to clone - and other ethical issues in pharmacy and medicine.	UiTM Publishing [Book]	Discussed about the advancement in biotechnology, pharmacy and medicine and its irrelevancy of adopting applied ethics that is based on secular approach. The	Implication of research (cloning & stem cell)	Ethical Relativism	Religious Ethics [Islamic Ethics, Catholic Ethics, Christian Ethics, etc]

Table 2 (continued)

Author	Title	Journal	Brief Summary	Focus Area	E t h i c a l Perspective	Morality
Foong (2011)	Human embryonic stem cell (HESC) research in Malaysia: multi-faith perspective.	Asian Bioethics Review [Article]	study points the need for religious principle as the foundation. Investigated the many religious perspective regarding stem cell research especially human embryonic stem cell. The embryo can be respected with necessary controls, limitations and accountability through appropriate regulatory framework.	Multi-religious perspective on embryo rights	Ethical Relativism	Religious Ethics [Islamic Ethics, Multi religious: Hindu, Buddhist, Christian & Sikh]
Amin, L., Rezali, N.I., Samani, M.C., Hassan, Z., & Jusoff, K. (2011)	Ethical issues on Biotechnology in four mainstream newspaper.	World Applied perspective Sciences Journal [Article]	Assessed the ethical issues relating to biotechnology which is not well addressed by the Malaysian media, despite the government's emphasize.	Stem Cell Awareness	Ethical Relativism	Religious Ethics [Islamic Ethics]
Foong (2012)	The regulatory regime for human embryonic stem cell (HESC) research in Malaysia: a critique	Malaysian Journal of Law & Society [Article]	Assessed the current regulation of human embryonic stem cell research in Malaysia from a legal based on its stem cell guidelines.	Stem Cell Regulation	Ethical Relativism	Religious Ethics [Islamic Ethics, Multi religious: Hindu, Buddhist, Christian & Sikh]
Abu Bakar Abdul Majeed (2013)	When cloning benefits mankind.	Islamic Institute of Understanding [News Article]	Addressed the issue of cloning (somatic cell nuclear transfer) and validation of Islamic belief based on the ensoulment process & the moral status of the cloned organism.	Cloned Embryo	Ethical Relativism	Religious Ethics [Islamic Ethics]
Sivaraman, M.A.F., & Nor S.M. (2014)	Ethics of embryonic stem cell research according to Buddhist, Hindu, Catholic, and Islamic religions: perspective from Malaysia.	Asian Biomedicine [Article]	Studied the ethical positions of the many faiths in Malaysia regarding the use of surplus' embryos and 'research embryos', whereby Hindu, Buddhist and Islamic ethics allowed the research but	Embryo Status	Ethical Relativism	Religious Ethics [Islamic Ethics, Hindu Ethics, Buddhist Ethics, Catholic Ethics]

Table 2 (continued)

Author	Title	Journal	Brief Summary	Focus Area	E t h i c a l Perspective	Morality
Sivaraman, M.A.F., & Nor S.M. (2015)	Human embryonic stem cell research: ethical views of Buddhist, Hindu, & Catholic leaders in Malaysia.	Science and Engineering Ethics [Article]	Catholics had reservations. Investigated the multi-faith of ethical viewpoints (Buddhists, Hindus and Catholics) in Malaysia relating to embryonic stem cell research based on sanctity of life, do not harm and finally the intention of the research.	Embryo Status	Ethical Relativism	Religious Ethics [Islamic Ethics, Hindu Ethics, Buddhist Ethics, Catholic Ethics]
Lye, J.L., Soon, L.K., Wan Ahmad, W.N., & Tan, S.C. (2015)	Knowledge & attitude about stem cell and their application in medicine, among nursing students in University of Science of Malaysia.	Malaysian Journal of Medical Science [Article]	Examined the level of stem cell knowledge, attitude concerning its application in medicine, and its link with years of education among University of Science undergraduate nursing students.	Stem Cell Exposure	Ethical Universalism	Universal Values
Azmi, A.G., Madieha, I., & Zawawi, M. (2015)	Human stem cell research: ethical and religious concerns over patenting biotechnological invention in Malaysia.	Kluwer Law International [Article]	Examined the patentability of biotechnological inventions especially those from human embryonic, proposing the United Kingdom (UK) and Europe's consideration.	Patentability	Ethical Relativism	Religious Ethics [Islamic Ethics]
Abu Bakar Abdul Majeed (2015)	Research ethics: sharing and scaring.	Conference BioBorneo 2015 [Proceeding]	Highlighted the ethical imperative and the issue of right from wrong concerning research.	Ethics	Ethical Universalism.	Universal Values
Amin, L., & Hashim, H. (2015)	The role of religiosity and religious acceptance in influencing attitudes towards embryonic stem cell research.	The Proceeding of the 6th International Symposium on Islam, Civilization and Science [Proceeding]	Determined that the Chinese are most experienced against religious tolerance compared to others in a study that looked into the role of religiosity and religious acceptance of human embryonic stem cell.	Religious Acceptance	Ethical Relativism	Religious Ethic
Abdul Rahman, S.H. (2015)	War 38 halal stem cell research and therapy: the Malaysian perspective.	World Academic and Research Congress 2015 [Proceeding]	Assessed the increasing public accessibility of stem cell therapies and incorporate	Halal Standard for Stem Cell	Ethical Relativism	Religious Ethics [Islamic Ethics]

Table 2 (continued)

Author	Title	Journal	Brief Summary	Focus Area	Ethical Perspective	Morality
Lai, D.P.K., Ramasamy, R.S., & Amini, F. (2016)	Knowledge, awareness, and perception of stem cell research among Malaysian medical students.	Tissue Engineering and Regenerative Medicine Society of Malaysia [Article]	Assessed the knowledge, awareness and perception of medical students in Malaysia about stem cell research and found they do not relate.	Stem Cell Awareness	Ethical Relativism	Religious Ethics
Amin, L., Hashim, H., Ibrahim, M., Che Ngah, A., & Sidik, N.M. (2016)	Effects of education level and religion on attitude to stem cells in Malaysia.	Akademika [Article]	Evaluated attitude level of Malaysian public (Klang Valley) about adult stem cell and human embryonic stem cell and concluded that they are positive and pointed adult stem cell as religiously accepted.	Stem Cell Awareness	Ethical Relativism	Religious Ethics [Islamic Ethics, Christian Ethics, Catholic Ethics, Buddhist Ethics]

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