

# Human Embryonic Stem Cell Science in Iran: Understanding the perceptions of the moral status of Human Embryos in the research context

Mansoorah Saniei\*

Department of Global Health & Social Medicine, King's College London, United Kingdom

## Abstract

This article is grounded on a large empirical study of bioethics and regulatory policy of human embryonic stem cell (hESC) research in Shi'a Iran. This case study in five research and academic institutions used in-depth semi-structured interviews to explore the view of stem cell (SC) scientists and other stakeholders related to hESC research and governance in this Muslim country. In fact, Iran has one of the most permissive policies on hESC research among Muslim states, while the country's legislation drawing on the Islamic faith. This article illustrates how Iranian SC scientists and policy-makers perceive the moral status of human embryos in the research frame. To this aim, themes that appeared as turning points in interview discourses on the nature of embryos consist of (1) reflections on whether the embryo is “human”, “potentially human”, a “collection of cells” or a “living entity”; (2) the distinction between the embryo inside and outside the womb; (3) the distinction between the embryo before and after ensoulment; and (4) a comparison of the ethics of human dignity and of healing. Based on the empirical evidence, this work therefore expands and refines the theoretical ethical foundation or mutual interaction between science, biopolitics and society in Iran.

**Keywords:** Stem cell science, Human embryo, Reproductive and Regenerative ethics, Qualitative study, Iran

**Citation:** Saniei M (2018) Human Embryonic Stem Cell Science in Iran: Understanding the Perceptions of the Moral Status of Human Embryos in the Research Context, *Adv Med Ethics* 4:1. doi: 10.12715/ame.2018.4.4

**Received date:** August 12, 2018; **Accepted date:** August 28, 2018; **Published date:** September 03, 2018

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\*E-mail: mansoorah.l.saniei@kcl.ac.uk

## Introduction

In 2002, Iran revealed one of the most permissive stances among Muslims when its Supreme Leader, Ayatollah Khamenei, publicly supported human embryonic stem cell (hESC) science and technology [1]. When Roman Catholics in some Western states, such as Italy, Germany, and the United States effectively blocked most funding of hESC research; it was a moral and religious responsibility to do this form of research in Shi'a Iran in order to find the cures for human sufferings [1]. The “Stem Cell Fatwa” by Ayatollah Khamenei, on the admissibility of the use of “surplus” in vitro fertilisation (IVF) technique to generate stem cells (SCs) for research purposes was seen as acceptance of hESC science in Iran [2]. This fatwa says: “Tell [scientists] to pursue the great objectives of this [stem cell] research with diligent efforts and to achieve that human enormous wealth

for themselves and the country [and] to be careful that producing identical parts of human beings does not lead to producing a human being” [3]. This affirmative fatwa was declared to respond to a request for religious comment on the use of human embryos for research, asked by Dr Kazemi-Ashtiani, a scientist and founder of the Royan Institute, a leading hESC centre in Iran. Based on this decree, research on the human embryos was permissible in Shi'a tradition.

Following this fatwa, the Department of Stem Cells in the Royan Institute was set up in the same year to produce, cultivate and freeze hESC lines and to create effective techniques for differentiating these lines into various types of mature cell, including cardiomyocytes, neural cells, etc. [4,5] Iran's political leaders and clergymen have also eagerly encouraged this area of bioscience, in the hope of enhancing the country's international position [4]. In 2003, an official Iranian

news agency, announced that Iran was among the first ten states in the world, and the first Muslim country which could create hESC lines [6,7]. Since then, Iranian SC researchers have carried out much work in different areas of hESC science, such as the creation of 6 lines of hESCs and 8 lines of mouse embryonic SCs, as well as registration of one hESC line in the International Society of Stem Cell Research [8].

In Iran, religion significantly influences the socio-cultural, moral, legal and political discourses on this field of science; and the deliberation of bioethics and governance of hESC research is considered as a moderate policy. Accordingly, the major discussion is about the level of the human embryos' protection as they are used to generate SCs and then destroyed [9]. After introducing research methodology and some background knowledge, this paper tries to find out the core themes formulating the discussion with particular reference to the ethical debates around hESC research in Iran. Then, it draws on information elicited by interviews with Iranian SC researchers and other actors involved in the emergent hESC research policy discussion. In Iran, similar to many other nations, policy for regulating hESC research mainly emerges from a deliberation between two moral principles: ethics of human dignity and ethics of healing. In this respect, religion has been highly influential role in Islamic Iran. This work presents views of the embryo debate and the therapeutic hope of hESCs as seen by interviewees.

## Method

Since little has been published about the views of Iranian researchers and other stakeholders on hESC research, bioethics and regulatory policy, an empirical case study method was designed. The case study is a suitable method when a researcher wants to study a subject in its natural setting and learn about the state of the art [10]. The main research project developed to integrate data from various sources utilising multiple methods, such as fieldwork, internal archival research, observation and interviews with 30 senior and junior scientists, embryologists, ethics committee members, regulators and policy makers (15 females and 15 males) related to hESC research, from five research and academic centres within Iran (the senior actors interviewed can be seen elites in that they all occupy

positions in powerful networks). To validate claims about the research sites, an online search was done for other sources to see if data from interviews could be verified and to identify any incompatible information and findings (e.g., about the ethical, social and legal guidelines on hESC research). Following ethical approvals by institutional review board at King's College London and the Royan Institute in Iran, "purposive"/"theoretical" and "snowball" sampling was carried out for maximum divergence of opinions and perspectives, with the purpose of recruiting enough numbers to achieve thematic saturation. It highlighted the significance of characteristics of research participants [11]. The range of professional backgrounds was purposefully varied. Interviewees were recruited using both formal and informal approaches and were verbally given explanations and information sheets illustrating the research. Between March and May 2010, the in-depth, semi-structured interviews were conducted in Persian as guided conversations [12] lasting 55-170 minutes (average 95); which allowed respondents to express their own words and form the discussion in ways associated with their experience. None of the research participants opposed to their interviews being anonymously quoted. Extensive series of questions covered respondents' understanding of hESC research and science policy, and their broad knowledge about the contextual aspects forming this field. All interviews were completely transcribed and then translated into English by the author, who is fluent in both languages, and then a thematic analysis was approached to interpret the transcripts. Thematic explanation of qualitative data can help better understanding the "predominant and important themes" [12]. This method of analysis assisted me to determine clear connection between themes and the objectives of the case study. By thematic analysis, I could connect the themes to each other and highlight the series of events. The themes and interpretation that generated were taken over with the author's supervisors and colleagues. This article cites quotations from respondents involved in hESC science policy-making (24 interviewees from 5 sites). It is noteworthy that even though the quotations are typical of those interviewed for this study; they may not be generalizable to the broader academic and scientific society in Iran. To maintain anonymity, study numbers were assigned and referenced to professions in general terms rather than by specific job titles. For

example, the classification of “scientist” could be used for those involved in generating the lines and for those who differentiate them into different kinds of cells.

## Results

In terms of when an embryo has human personhood with full moral rights, most of the interviewees affirmed that human dignity as an absolute value emerges from the constitution and is granted to individuals. Human dignity is a predominant principle in Article 22 of Iran's Constitution of 1979, which expresses that “Human dignity, life, property, rights, residence, and occupation of the individual are inviolate, except in cases sanctioned by law” [13]. This principle was not, nonetheless, regarded a barrier to deliberate on hESC research and science policy in Iran. For instance, one interviewee stated that: “It [human dignity] is not integrated into the issues of the embryonic stem cell. It is a notion for an individual that indicates the dignity. The religious texts guide our regulatory system anyway” (General Physician/Ethics Committee Member/2/Male). Human dignity is therefore seen to be a significance principle that associates with individuals rather than other entities, including the human embryo, which does not have particular biological elements: “This concept does not apply to any biological things” (Medical Law/Ethics Committee Member/10/Female). “It is a ‘cultural notion’. It signifies the possibility for individuals to make their own decisions” (Scientist/22/Male). According to some Muslim scholars, the individual comes into existence at some time after conception, not at the moment of fertilization; thus, there is adaptability in the usage of the conception of dignity in the process of permitting hESC research [5]. As several interviewees noted: “It [human dignity] is very crucial and cannot be independent of our religious beliefs. It implies respect for individuals” (Scientist/16/Female). “It is a value, which is significant for our religion. If we suppose that it [an embryo] is an individual, then we have to protect it” (Embryologist/24/Male). “Embryos have special status, but they are not as human beings. They are deemed to be respected, protected, but not like individuals (Scientist/Ethics Committee Member/9/Male).

## Themes

The literature illustrates two extremes in views about the moral status and dignity of the human embryo. One position sees the embryo simply as a “bunch of cells” and an unproblematic biological resource; another believes it to be a “human being”, and it is morally wrong to use it for research [14,15]. Themes that appeared as turning points in interview discourses on the embryos consist of (1) reflections on whether the embryo is “human”, “potentially human”, a “collection of cells” or a “living entity”; (2) the distinction between the embryo inside and outside the womb; (3) the perception between the embryo before and after ensoulment; and (4) a comparison of the ethics of human dignity and of healing.

### *A bunch of cells*

Concerns about hESC research are usually reduced to concerns about the status of the embryo. As noted earlier, those who hold that the embryo at conception should be treated as equivalent to a human being are pitted against those who view the embryo as “just cells”. While there is some truth to this characterization, in reality interviewees' views are more complex and raise a diversity of issues. Examples of how the “bunch of cells” concept was the starting point came from several interviews: “It is hard to exactly say what an embryo looks like. I do not consider it as a human being. I even do not regard it as a potential human” (General Physician/Ethics Committee Member/2/Male) “When I talk about the excess ones [embryos], I do not think of them as individuals” (Theologian/Ethics Committee Member/30/Male). “Those embryos we have for research are ‘just cells’ it is a ‘bunch of cells’. You might say that we decided that they should not become individuals, when we use them for research” (Scientist/12/Male). Several interviewees compared the embryo with the foetus; some even considered embryos as simply “laboratory tools”: “In fact, there is a big difference between the systematized organism-I mean the foetus after ensoulment—and an embryo which consists of several cells, ‘just cells’. As far as I know it is not a person, we can use it as a ‘tool’” (Embryologist/Ethics Committee Member/29/Female). “It [embryo] is a basic format [of life] in the stage of blastocyst. So, it is not a human, even [it]

does not have limbs. It does not have any organs yet. [There is] no soul yet” (Scientist/13/ Male). Similarly, “Look, the spare embryo is not like a foetus with hands and feet. You have a bunch of cells and derive stem cells from that. They are just cells, nothing else. I see this as a mechanical system, rather than even an organism, my view is quiet similar to Islam” (Scientist/Ethics Committee Member/11/Female). For these respondents, embryos are just the ball of cells, not an actual human being. This is much in line with findings of Kathryn Ehrlich and her colleagues who explored the views of British practitioners and scientists who dispose of spare embryos or use them for research [16,17]. This understanding of embryos as cells is a common view amongst the scientists I interviewed, as it was in a study of British stem cell labs by Steven Wainwright and his colleagues [14] and a Danish study conducted by Svendsen and Koch [18]. The quotations from interviewees show what is seen as a commencing point of discourse about what the value and social moral position of the embryos. Descriptions of the embryo included “not a real human being”, “not an individual”, “just a ball of cells”, and “just a little ball of cells in that stage”. However, some interviewees did not consider the embryo as identical to a ball of cells; rather, their discourses emphasize the phenomenon of sequential distinctions of the embryo. Another group of respondents saw the embryo as a “potential human being”.

### ***Potentiality of a human being***

Some respondents considered the embryo to be a potential human however; they gave it the right to live only after a certain stage of its development, for instance, after implantation into the womb or ensoulment. Until then, for them, the embryo is just a “collection of cells”. However, those on both sides of this distinction raise the question of the embryo's potentiality-whether the surplus IVF embryo is a potential human, potential life or something else. For instance, several interviewees said: “I can see it just as the potential human being. It is hard to say. There is a conflict. Well, I sometimes think of it and see it as a human. But Islam does not say the same [does not see an embryo as a human]. This embryo could develop into a human. It is a potential human” (Scientist/8/ Female). “I say [it is] just an embryo. [Laugh] Not a

human, not a baby. For me, this multi-cellular embryo is, biologically, a ‘collection of cells’ which has the potentiality of a human being” (Scientist/1/ Male). “As a scientist, I believe that we should consider a pre-implantation embryo as living cells, which has a potentiality to become a human, like you and me. Now, at what stage it has rights and dignity is another story” (Embryologist/Ethics Committee Member/25/Female). For those who believe the embryos to be the potential human beings, in whom they possess the right to life, the question is if the potentiality of being a human grants the embryo any exceptional rights. Michael Lockwood described that if X is seen to have an active potentiality for developing into Y, and Y is regarded to possess an active potentiality for becoming Z, therefore X has active potentiality to become Z [19]. Accordingly, the egg, sperm, fertilized egg, embryo, new born baby and adult human deserve the same intrinsic morals. In this respect, Lars Ostnor stated that: “There is no morally relevant difference between being a grown up human being in potentiality and in actuality. The embryo, qua a potential person, hence has the same moral standing, from conception and onwards, until being a person in the full sense” [20]. In response to this claim, Michael Sandel made an analogy and noted: “Although every oak tree was once an acorn, it does not follow that acorns are oak trees, or that I should treat the loss of an acorn eaten by a squirrel in my front yard as the same kind of loss as the death of an oak tree felled by a storm. Despite their developmental continuity, acorns and oak trees differ” [21].

Nonetheless, a person may begin his life as an embryo, but it does not affirm that each embryos is a person. According to some scientists in my study, “potential rights” are not the same as “actual rights”. Indeed many rights of potential persons are only potential; they become actual rights only when the embryo or foetus becomes an actual person. As one interviewee pointed out: “Islam indicates that an embryo is perceived as a human life, only later on in the biological development because the Holy Qur'an uses the words “there after we produced him as another creature” (Scientist/8/ Female).

Drawing a line between actual and potential human beings, Shari'a (Islamic Law) concludes that the actual human should be granted more respect and protection.

Many Muslim scholars agree that ensoulment draws a distinction between biological life-which occurs at the moment of fertilisation - and human life [22]. One interviewee hold the view that an embryo could be a potential human since, in case of pregnancy, it can run its full course and be born as a human: “That [embryo] is a potential child. If it had a chance to transfer and develop inside the womb, it would become a child. I work with its cells and feel that they [cells] are like my children. This is really a potential human but it helps to progress science and to find a treatment for [health] disorders. That's just a potential baby” (Scientist/21/Female).

These respondents consider that embryos have a potential life but are not equivalent to actual human beings because they are incapable of surviving independently outside the womb. Two other interviewees echoed this thought: “Look, this is a multi-cells entity with a biological identity. The only difference between this one and the other cells is that if it is located in a suitable condition, it maybe [would] develop into a human being. Sometimes the embryo is aborted one or two weeks after implantation and even the [pregnant] woman cannot recognise it” (General Physician/ Scientist/15/Male).

“Well the others say that this is a human, but I do not see it as a human at all. It is not yet, at least in my religion, it is not a human yet. But, well, it has the potential for being a human. I am not sure. Many infertile women receive good embryos, but they do not get pregnant, or those foetuses are aborted. However, I feel uncomfortable when I think that they [foetuses] might become a human” (Scientist/5/Female). According to Insoo Hyun, it might not be correct to think that every human embryo is a potential human and can produce a full human being. Many of them are not able to yield a successful pregnancy even though they might produce hESCs [23]. He also added that developmental biologists have claimed that 75-80 per cent of total embryos generated for infertility treatment may not implant into the uterus or are aborted because of genetic anomalies. Therefore, potentiality cannot guarantee that they would become a human [23]. However, most interviewees in my study held a developmental view in which respect for and the dignity of the embryo increase as it moves forward in its journey towards

becoming a person. There are various opinions about the point in this process at which an embryo or foetus should have exceptional protection [5,24].

### ***Developmental view: Two gradualist approaches***

Assertion of the purity and inviolability of life from the moment of conception authorized definitive rights to the embryo, similar to the rights of adult human beings. To the contrary, the concept of gradual and conditional right and respect comes from the opinion that the embryo at its early stage of development is just a collection of cells, which does not possess rights equal to those of adults. Nevertheless, this collection of cells is recognized as a human being in essence and deserves to have respect for it to grow as it develops. In this view it acquires moral rights by gradual stages after fertilization, with the possibility that it might be ethical to use embryos for research at certain stages [5,9]. This section demonstrates differences in the views of participants who hold a more developmental view in terms of the point in the process at which an embryo earns special protection. The two points in the process that were identified were implantation into the womb and ensoulment.

### ***Embryo implantation***

Some scholars, who hold the developmental view of personhood, agree that the embryo gradually grows into a complete human being, so that in an early phase of its development the embryo does not deserve the moral protections it would acquire at a later developmental phase [25]. In this respect, respondents in this study commented: “It [embryo] is a ball of cells before going to the womb. If it [embryo] does not reach that stage [lodging in the womb], it never develops into a human being.” (Scientist/3/Male) “[In the laboratory] it [embryo] will never reach the stage at which it looks like a human. So I do not think of it as a human. It is a laboratory tool. The implanted embryo in the uterus is a potential human.” (Medical Physiologist/Scientist/17/Female)

Some interviewees distinguished between the implanted embryo developing in the uterus and the “spare” embryo that exists outside of the woman's body and will never reach the stage of ensoulment. In Islam the moral importance of the foetus has been

linked to its development to a particular stage when it gradually attains the full moral rights associated with personhood [26]. Islamic jurisprudent has mostly considered implantation of the embryo as the certain stage of foetal life when any infliction of harm to it requires compensation [5,26]. In case of abortion, the rule is extrapolated from the interpretation of the verse in the Holy Qur'an that reads: "It is He who produced you from one living soul [nafs wahida], and then a 'lodging- place' [mustaqarr] and then 'a repository' [mustawda]" [27]. A "lodging place" is the uterus, whereas "a repository" is the loins in which certain characteristics are maintained for future generations. Obviously, these principles in no way suggest an attempt to define the starting point of foetal life in the womb [22]. In the same vein, one scientist noted: "When it is lodged in the womb, it then starts to develop. It forms [differentiates] step by step and then reaches the stage of organogenesis. I think, afterwards, it becomes a system, which deserves protection" (General Physician/Scientist/15/Male).

For some proponents of hESC science, as also observed by Kristina Hug, the human embryo is thought to be an exceptional entity that deserves to be treated with honour and has considerable moral status, dependent on the phase of its development [28]. Similarly, as one participant stated:

"It [embryo] is a biological entity its protection is in accordance with its gradual development, which is defined based on the social, religious interpretation" (Medical Lawyer/ Ethics Committee Member/10/ Female).

Most of the interviewees held the intermediate view that religious and legitimate protection of the embryo increases with the stage of its development in the woman's uterus. Based on the Islamic conception that human life emerges at the moment of ensoulment, a large number of Muslim jurists and intellectuals approve research on the pre-implantation human embryo on the idea that it cannot independently develop into a human being outside the womb [26]. In line with this argument, Hassan Hathout, a Muslim scholar stated that an embryo "cannot produce a human being unless implanted into the uterus, and so implantation was taken to herald the sanctity of human life"[29].

He then said: "A fertilised ovum [embryo] in storage does not, however, possess the same rights as a foetus and it may be used if the purpose is to protect and save human life" [29]. This suggests that the embryo's status changes during its journey from fertilization to implantation, and that it differs by context, inside and outside the womb.

### *Ensoulment*

As discussed, according to Islam, the person exists only after a certain phase of embryonic growth. In this journey, ensoulment is presumed to be a core value in the embryo debate or even in discussing a moral status of a foetus [5,30]. The following paragraphs more clearly explain the embryo debate and the importance of ensoulment as the research participants saw it. In interviews and conversations several respondents pointed to the relationship between being an individual and having a certain characteristic, mainly ensoulment, when they talked about their feelings about using the embryo in research. Sometimes scientists clearly relied on religion in distinguishing between human and non-human, For example: "The Ulama [high-ranking religious intellectuals] said that we can consider a foetus as a human being from 120 days. This means that in the first 5 to 7 days of its development, it is not considered as a human, although it is a being and a potential human" (Scientist/27/Male). "The embryo does not have a soul. Islam says that God does not send His spirit yet. You can work on it. Discarding this for producing stem cells is not equal to murder" (Scientist/7/ Male).

These scientists agreed with using the embryo for research purposes and did not consider the destruction of the embryo - or according to scientist 13, "undifferentiated embryonic cells" - as murder, because there is nothing but a possibility that these cells will develop into a human being. Essentially, a line is drawn between potential and actual human life. This view is mainly situated in religious culture and teachings, although there is no precise explanation for the beginning of life. On the same lines, one interviewee noted: "According to our cultural background, abortion, for instance, is permitted until a certain time and it is not a sin. But, as soon as the soul meets the body. Islamic law defines a certain time for this [ensoulment]. Well,

this [religious] background remains in our mind. Even without a strong belief to the religion, it is hard to think differently” (Scientist/12/Male).

This scientist stressed that such a belief is embedded in his culture and religion-“religious culture” or “cultural religion”-even for those who do not consider themselves to be religious people and claimed that they were not familiar with Islamic deliberations on the subject. As one respondent said:

“Well, to be honest, I do not know too much about the religious issues. I mostly work based upon my feelings, thoughts and knowledge. Anyway, I saw in the Qur'an that it [the embryo] should pass through several stages and then meets a soul. I cannot say that it does not have a soul until this day [120 days after fertilisation] and then [it] will have the soul in the day afterwards. But I always believe that life has a high value. Well, according to the Holy Qur'an, it does not have a soul, but it is alive. Life has a value” (Scientist/6/Female).

Similarly, “It is that point of life which we were not able to see in the lab. I still think, if this embryo had a soul and then we derived its stem cells, what would happen to the soul? The soul might follow these cells. You can think this way, right? But, does it [embryo] have a soul? This is what Ulama can reply to, and science is not still able to talk about. They say that it [ensoulment] occurs 3 or 4 months afterwards. Wow, imagine if it begins at another moment” (Scientist/Ethics Committee Member/9/Male).

However, the moral status of the embryo and ensoulment are not the matters of importance for some interviewees. One respondent said: “Islam allows us [to use an embryo for research purposes]. Even if religion did not allow it, I would not have any problem in working with them [embryos]. I cannot remember when ensoulment happens. Even if it had soul from the beginning, I would not have any problem. Someone else asked for the donation. No one forces the woman to donate her embryo. We use them to find treatment for diseases” (Scientist/21/Female).

It seems that most of scientists in this study might not be interested in solving the moral debates on their own, while religious scholars, bioethicists, policy makers, regulators and humanities practitioners cannot

deliberate without more recent scientific knowledge. With the improvement of knowledge about embryo growth as a result of new bioscience and technology, some scholars have suggested that ensoulment might take place earlier in embryonic development [22]. In fact the ensoulment is linked to concept of personhood, which is obviously considered as a point in time that influences the moral status of human beings. Moreover, the theological definition of personhood is to some extent supported by biological concepts. The combination is therefore based upon creation of a new entity that never existed before and has a unique identity.

Ensoulment is important for deciding on regulations for medical interventions affecting the embryo. Personhood as a philosophical concept is discussed by Muslim schools of thought to question whether it conforms to the biological growth of a human being. In past Islamic tradition, the notion of ensoulment was used to define what certainly separates humans from other beings, and even at what stage of embryonic development personhood emerges [5,30].

In general, most verses of the Holy Qur'an which are usually quoted against destruction of the embryo or the foetus actually deal with the sanctity of life. For instance, one of the oft-quoted verses in this section declares: “If anyone slays a human being unless it be [in punishment] for murder or for spreading corruption on earth-it shall be as if he had slain the whole of humankind” [31]. Another verse forbids killing of children: “Slay not your children for fear of poverty. We will provide for you and them. Surely, the slaying of them is a grievous sin” [32]. Still another verse forbids the pre-Islamic practice of burying live female infants for fear of poverty or disgrace: “And when the female infant, buried alive is questioned for what crime she was killed” [33]. However, none of these verses deal with abortion per se; nor do they deal directly with the ontological or legal moral status of the foetus or the religious-legal consequences of expelling it before complete gestation.

In this study, the viewpoint of scientists and other stakeholders associated with hESC science and policy who continue to debate legitimising embryo research up to a particular moment of embryonic development,

can partly be understood as slightly different efforts to reply to the same inquiries about personhood and ensoulment as have arisen in other cases, such as abortion. The responses to questions about, for instance, when human life begins and when personhood starts have varied according to the socio-cultural context and have changed with shifts in the and religious beliefs, sometimes as a result of scientific advances [34].

### ***Saving Lives as a Moral Duty***

In moral discussions about hESC research, one stance is rooted in the healing argument and the pluripotency of the cells, their benefits for improving biomedical knowledge, and their possible therapeutic applications, although it still takes a long time to derive cures from these cells [35]. Some interviewees expressed views on the usefulness of hESC science for facilitating basic research and its potential therapeutic benefits, arguing, for instance, that: “Shi'a does not restrict us to the limited action, especially when it is related to helping people.” (Medical Physiologist/Scientist/17/Female). “They [Iranian policy makers] somehow encourage us to do this kind of [research] project. This field, it seems, can respond to many human problems related to [medical] disorders, war- damaged people, and many scientific questions.”(Scientist/7/Male)

Similarly, another interviewee noted that: “If the [hESC research] projects are defined well, they might eliminate human diseases and suffering either in our country or in other parts of the world. We should continue doing research on stem cells with the aim of developing medicines and cures for so far incurable disorders” (Scientist/Ethics Committee Member/28/Male).

Several respondents stated that they were encouraged for conducting this field of research when Ayatollah Khamenei publicly supported hESC research in 2002. For Iran’s Supreme Leader, the main reason for doing hESC research was its “global benefit” for human beings. He encouraged scientists to advance the technology to save lives, considering it a religious duty to carry out research in order to develop new medicines and technologies that can benefit humanity [9]. Professor Hossein Baharvand, director of the Department of Stem Cell Research at the Royan Institute in Iran,

stated that “[The] vision is to efficiently put stem cell research findings into operation in disease treatment to increase the level of health” [4]. The task of scientists, then, is to promote scientific progress and keep Iran on the leading edge of discovery.

“We should move towards treating people through this method [hESC research and therapy] but we have to consider the ethical debates. This is our duty. There is no prohibition [on hESC research] in Iran and our policy is open-minded. Our research institutes are very active in human embryonic stem cell science to find the cure for debilitating diseases” (Theologian/ Ethics CommitteeMember/30/Male).

One interviewee said: “Given its therapeutic benefits, human embryonic stem cell research should be encouraged. I wish a healthy future to my people” (Scientist/19/Female).

According to the interviewees, noted above, and because in Islam the human embryo does not have the same moral status as human beings, it could be said that a higher ethical responsibility is to utilize the embryos and SCs to find/generate treatments for so far incurable diseases to rescue people who are suffering from debilitating and chronic disorders. In other words, usage of the embryos for research in the early stage of their development is morally reasonable and acceptable if there is an intention for further production of knowledge and finding novel pathways to develop treatments for relieving human sufferings. Moreover, the principle of the public good is applied to permit hESC research, which gives hope of finding cures for debilitating conditions. In this regard, Abdulaziz Sachedina stated: “It is correct to suggest that a majority of the Shia and Sunni jurists will have little problem in endorsing ethically regulated research on SCs that promise potential therapeutic value” [36].

### **Discussion and Conclusion**

Based on socio-cultural, legal, political and religious tradition, each society might accept the sacredness of human life and the ethical responsibility not to harm a human being. While the hESC science itself is regarded as good in view of its ultimate goal to seek treatments for diseases, the nature of science that requires the



devastation of human embryos has caused serious moral disputes. Bioethics in the Iranian context approves endeavours to secure human lives. In reviewing the ethical viewpoints of Muslim scholars in this country, it shows that donation of IVF embryos for research purposes that may lead to saving lives is accepted; while legitimacy of hESC science is conditioned on the fact that these embryos are not produced specifically for research [35]. Furthermore, the concept of donation is applied in arguing the acceptability of utilising “spare”/ “surplus” IVF embryos. Similar to other nations and traditions, Islamic Iran also maintains knowledge-seeking in high regard. This faith considers good intentions driving hESC research and knowledge-seeking to be noble and highly esteemed.

On the basis of empirical data, this work examined discussions of how Iranian SC scientists and other stakeholders relevant to hESC science and policy see the moral status of the human embryo in the research context. Opinions from my research participants were mostly expressed based on the Shi'a Islamic values. They showed that the religio-political context have opened the door for adoption of a flexible policy in bioscience, such as hESC research. Some respondents saw the embryo as “just a collection of cells”, and/or a “potential human being”, though some maintained the “gradualist approach” to the moral status and dignity of human embryos. In the gradualist approach, interviewees drew attention to two stances in the developmental process: implantation into the womb and ensoulment.

For some interviewees, implantation of the embryos into the uterus is seen as a stage of embryonic development that implies increasing moral status. As in a British study by Wainwright and his colleagues, some of their participants affirmed that the implantation into the womb is considered an important point of change between the status of embryos inside and outside the uterus [14]. In the report 2017 of the Nuffield Council on Bioethics about the Human Embryo Culture, Elseijn Kingma expressed the view that the location of the human embryo, e.g. inside or outside of the womb, might influence its moral status [36,37]. Furthermore, Silvia Camporesi explained how various “context” generate a “unique cell”, and believed that we cannot discuss the moral status of the embryo

without considering its context in which the embryo develops, for instance, reproductive or research one [38]. Accordingly she said: “It is not sound to state that the embryo is alienated when transferred to a context different from the reproductive one, because the practice of extracting ES [embryonic stem] cells from a surplus embryo (result of in vitro fertilisation) does not imply this transfer, since these embryos are already in a different context. Surplus embryos are a reality of in vitro fertilisation and, since researchers do not transfer them from a reproductive context to one of research, the moral concerns with regard to reproduction do not exist.” [38].

Concerning the importance of the ensoulment, most of research participants believed that ensoulment is a useful turning point for reconciling the external characteristics which granted an embryo moral value and the essential elements which might help us to explain more categorical about the moral status of the human embryo. In the 14th century, Muslim scholars discussed the issue of ensoulment extensively. As an example, Ibn Al Qayim (14th century AD) stated:

“If it is asked: Does the embryo before ensoulment possess life? It is answered that it has the life of growth and nourishment like a plant. Once the soul enters the body then it has the sense of perception and volition (which constitute the basis of human life)” [39].

Ibn Hajar Al Asqalani argued that the liver is the first organ shaped in the human embryo as it is crucial for nourishment and growth. He affirmed that formation and development of the brain comes at a later stage when the soul enters the foetus [39,37]. In this respect, ensoulment is connected to the development and integration of the nervous system, where centres of awareness and volition are found. In my study, most participants felt that being a human depends on a certain condition, the ensoulment. However, for the most of interviewees, the human embryo in the early stages of growth deserves respect for its potentiality, but respect does not extend to giving it the complete ethical and legal rights credited to the human beings.

The present study has also described how the Iranian SC scientists and other scholars engaged with hESC science and policy promoted views on the “therapeutic

hope” of hESC in the name of the “ethics of healing” and humanity. The term “therapeutic hope” points to expectations about the future of biomedicine and organises the scientific knowledge, values and actions around the hESC debates [35]. Hence, this term affects the pathway of this field of research in the governmental debates and in the regulatory system. There are two different (though not opposite) policy themes operating in Iran. In the supportive discourse about hESC science, the vision of its therapeutic promise was embedded in an optimal social order in which the state encourages and develops innovative science and technology. In parallel with the “embryo debate”, Iran has expanded the discussion of hESC research to incorporate discourse related to its therapeutic application. In fact, the policy scenario that supports hESC science seems to signal the religious essence of the Iranian socio-political order and the validity of innovative, scientific, and therapeutic purposes while respecting the “ethics of human dignity”. In other words, In Iran, both the ethics of human dignity and the ethics of healing are framed as ways to achieve a morally acceptable and responsible innovation. Given the religion-based regime in Iran, Islamic law is the root of Iranian policy.

Instead of the struggle between bioethics, religion and bio-scientific realities that occurs in many countries, such as Italy [40], in Iran both the ethical arguments about hESC research—respect for human dignity and commitment to healing in the name of humanity—are closely intertwined and together reinforce the promotion of hESC science. Therefore, the embryo debate and therapeutic hope go beyond any clash between science and religion; and the Iranian regulatory framework advocates hESC science that uses “surplus” embryos from IVF treatment, which would otherwise perish. In this Islamic country, a similar dynamic emerged during the debate on the Act of Embryo Donation to Infertile Spouses [41] and the Therapeutic Abortion Law [42], both adopted in 2003, which balanced the Islamic viewpoint of Iran and its ethical, socio-political and legal standards as the prevailing and principal doctrine of society supporting the Iranian social order. As has been shown in some Iranian publications, these Iranian regulations and laws embodied the Islamic value and principle of the sanctity of life and the right of human being to live from 120 days after fertilization [1,5,30,35,36,43,44].

## Acknowledgements

The work upon which this piece is based is funded by the Wellcome Trust Biomedical Ethics Developing Countries (Grant No. 086072). The authors warmly thank Professor Clare Williams, Department of Sociology & Communications, Brunel University London, Professor Alan Cribb, Centre for Public Policy Research, King’s College London, and Dr. Silvia Camporesi, Global Health & Social Medicine, King’s College London for their insightful and constructive comments during data collection, analysis and discussion.

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