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Editorial: Bioethics and Betterment of Lives

I would argue that the primary principle of bioethics is beneficence, loving to do good. There are many ways that we can improve the lives of others, and some of the basic dilemmas of such advancement are represented in the papers published in this issue of *EJAIB*. After having 10 articles in the January 2014 issue, this issue sees only 4 – because the length of the first two is long.

A. S. M. Anwarullah Bhuiyan presents his review of Bioethics and the Challenges to Its Development in Bangladesh. The article includes the mention of the Bangladesh Bioethics Society that I had the great

pleasure to be involved in the establishment of, and the general secretary, Prof. Shamima Lasker is a Vice President of the Asian Bioethics Association, who also talked on bioethics in the country during ABC14.

Latifah Amin et al. present the results of a survey on Ethical Perceptions of Genetically Modified Crops in Malaysia, which confirms some earlier research that people in different countries draw different reasons about different applications of plant genetic engineering. The perceived benefits are important determinants of the choices that are made, as are risks and concepts of what is natural. The issue of safety to the consumer is on of food ethics, but as Prof. V. Balambal shows, in Ethical Values of Food Safety, there are many problems in ensuring food safety for people in production and dietary habits.

Amber Ali Muhammad discusses some Issues of research ethics in developing world, with some reflections from Pakistan and elsewhere. The idea of beneficence also is a common justification for research.

Whether we argue that bioethics is love of life, or follows the system of four principles of bioethics, or virtue ethics, or utilitarianism, etc., all people argue that bioethics is about doing good. As we consider the topics of our next projects for research in bioethics, reflect on the principles that motivate our choices for helping make the world better. Some of those topics will be presented in ABC15 in Japan, or other places (including the conferences of AUSN in Mexico on 29 June; or elsewhere), so please follow the conferences on the website and look forward to seeing many readers there.

At American University of Sovereign Nations (AUSN) we will be holding summer schools to allow people to also obtain a Postgraduate Certificate in Bioethics and Global Public Health, for those who cannot come to do the whole Masters in Bioethics and Global Public Health, so I look forward to meeting many readers at the new campus and environment.

Please follow the updates on the website.

– Darryl Macer

Bioethics and the Challenges to Its Development in Bangladesh

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1. Introduction

Several bioethical issues, such as reproductive medicine, euthanasia, HIV/AIDS and biotechnological applications, have been emerging in the field of biosciences. Other issues include cloning and stem cell research. HIV/AIDS is a bioethical problem that resulted in ethical guidelines in order to manage its spread as an epidemic. Informed consent is often deficient. There are no clear bioethical guidelines for maintaining biotechnological practices or in the case of end-of-life decision-making. In the context of Bangladesh, many of the issues in the biological sciences cannot be mitigated by our concrete knowledge of science. For example, ethical issues of informed consent, confidentiality, naturalness, the duties of health caregivers and the status of life are clearly absent in the treatment of infertility or in discouraging assisted reproduction, termination of life, the intolerable public health impact of infectious diseases and practicing biotechnology.

All these problems reflect a rationale that Bangladesh is an appropriate place in which to incorporate bioethical theories in different sectors of health, bioscience laboratories, etc. However, in Bangladesh, the academic curriculum, bioscience-related policy/guidelines and professionals are not yet prepared to face problems from bioethical perspectives. In the near future, there is hardly any hope of development of bioethics in Bangladesh. Keeping this in mind, this article will take a critical overview of some issues of bioethics that are poorly performed in different sectors of health, bioscience and in policy guidelines. Section 2 will focus on urging an essential multidisciplinary approach to bioethics that is already lacking in our educational policy. Sections 3 and 4 will focus on moral issues related to bioethical problems. Against this backdrop, this article intends to seek ways that could reinforce ethical values and promote compassion in formulating bioethical policy for Bangladesh.

2. Understanding Bioethics

Before exploring the scenario of bioethical practices in Bangladesh, firstly, I will attempt to describe the nature of bioethics that will help in understanding the problem in detail. Bioethics is coined from two Greek words: *bios* and *ethos* which mean life and values, respectively. According to its etymological meaning, bioethics is concerned with the values of life. Van Rensselaer Potter¹, a pioneer of modern bioethics,

concludes that the term “bioethics” can be understood from the biological and ethical perspective together. As such, Potter means that bioethics is linked with both the biological science and ethical perspective and has a wider scope from science to ethics. In the early 20th century, it was observed that different issues were being incorporated in bioethics. Therefore, an essential question may arise here: why has Potter’s exposition of bioethics failed to grasp the leading issues of bioethics? As we have found, Potter used the term “bioethics” — *bios* in terms of *life* — in all its forms. Undoubtedly, this is a broader approach to understanding bioethics. However, in the second half of the 20th century, bioethical problems received ethical consideration only for assessing the controversies of medicine, health care and health-related technology. In the challenge of bioethics, critics often lay blame on Potter for inviting some irrelevant issues that have created far-reaching confusion here. As a discipline, bioethics examines the ethical issues particularly in health science, medicines and policy related to health policy. Owing to the development of bioethics, sick people and their rights have been acknowledged by health care professionals and concerned people. Therefore, what should we understand by the term “bioethics”? And what are the challenges that have been faced by Bangladesh? In response to these questions, this article considers the definition of bioethics offered by the United Nations Educational, Scientific and Cultural Organization (UNESCO).

According to UNESCO, we can understand the term “bioethics” over a wide spectrum of life. It covers environmental, medical and clinical problems. Darryl Macer, who used to work for UNESCO, defined the term “bioethics” as “love of life”.² Love helps to overcome selfishness, and craving for love can make the society pursue a harmonious life with heartfelt ties between individuals and communities. Therefore, the terms *ethics* and *love* can be used interchangeably, and bioethics is understood to mean *love of life*. The following discussion may identify the definition of bioethics that would be compatible for Bangladesh.

2.1 Challenges of Bioethical Practices in Bangladesh

In response to the second question above, this article refers to several challenges that have been faced by bioethical policy in Bangladesh. At a glance, they are:

- a. The challenge of poverty
- b. Lack of a multidisciplinary approach
- c. Problems of allocation of health care resources and rights of people. Equalizing access to health care and medicines
- d. Cross-cultural cohesion
- e. Ensuring that science and technology are put in the service of promoting public health

While we are thinking about bioethics in Bangladesh, we should know about what has been published or discussed in the last few years about

¹ Potter, V.R., 1971. *Bioethics: Bridge to the Future, USA: Englewood Cliffs, N.J.: Prentice Hall Inc, pp. 3-4.*

² Macer, Darryl R.J. 1998. *Bioethics is Love of Life: An Alternative Textbook*, Chistchurch : Eubios Ethics Institute.

aspects of bioethics. What are the relevant issues related to bioethics that should be discussed? Have we grappled yet with the issues of reproductive ethics, health care, medicines or biotechnology? Suppose that it was considered appropriate that most wealthy people in Bangladesh including political leaders, members of cabinet and businessmen preferred to have their medical treatment and post-treatment management undertaken in affluent countries. This would be reason for failing to rearrange the governance system in the field of bioscience and the health care system. There are some others problems that have also been focused in the forthcoming sections.

2.1.1 Poverty and Pseudo-Democracy

An understandable relationship exists between poor economic strength and bioethical formulation which cannot be ignored in the context of Bangladesh. In reality, it has been foreseen that less strength in economic growth is quite unhelpful in construing a viable bioethical policy. However, in order to incorporate bioethical governance in the existing realm of bioscience and health care sectors, it is essential to provide available funding and organizational strength. Bioethical governance in the field of bioscience can play a role as a regulating force towards motivating bioscience, medical and health care professionals. It also shows the way that they can perform at their best with responsibility and sincerity. However, poverty and economic scarcity have become significant obstacles in formulating such an ethical framework. This is potentially one reason for failing to progress the field of bioethics in Bangladesh. In addition, research in the domain of bioethics is not financed nor is there any budgetary allocation or funding in this area of research.

Furthermore, none of the political parties has any degree of will or promise with regard to bioethics either in their political agenda or governmental policy. They are not very interested in this kind of domain of research. Due to the scarcity of intention, the Bangladesh government has not yet formulated the necessary legislative or structural protection to introduce bioethical issues. As a result, in the public sphere, bioethical issues are yet to become popular. Along with this problem, Bangladesh has a serious urge towards a renewed sense of democratic values. However, corruption and lack of good governance as result of the unstable pseudo-democracy have become other candidates for the lack of accountability among bioscience and medical professionals.

2.1.2 Cultural Values and Bioethics

What exactly is working in the nature of values in Bangladesh? It is not easy to give any straight response to this question. However, it has been claimed that we are participating in "shared values" as the national strategy of Bangladesh. It has sometimes been urged that to combat national or value-related crises, we should stress religious tolerance and harmony among the different religious and ethnic groups. It is an established consensus that Bangladesh

is a pluralistic society consisting of different religious and ethnic communities.

Muslims, who, in general, follow the norms and principles of the *Qur'an* as the most sacred way of life, constitute the major segment of the population in Bangladesh. However, those principles do not explicitly reveal many means with which to counteract different bioethical problems. In fact, the roles that civil communities play in this regard are based on the secular ideal of the state. On the other hand, some religious idealists oppose all possible options thus deterring a congenial atmosphere in which to formulate a bioethical framework. Yet, we cannot solve some problems whether we advocate for the values of individual rights or promote societal values. Suppose someone asks a doctor to kill him as he has been suffering from an incurable disease with intolerable pain. In that example, a decision based on individual rights may not see anything wrong with active euthanasia, but religious values, particularly the Islamic ideal, may be at stake or in conflict here. However, in our hospitals and in the context of the contribution of bioscience, this requires a decision to be made. In most cases, the values of Islam are not useful as a means by which to promote quality policy guidelines. If we only have Islamic values, then our moral discourse will be impoverished and contradictory to the norms of other religious segments of the population. It will also be unable to construe higher and integrated forms of bioethical policy.

Therefore, in articulating a policy based on a particular religious vision, it is quite difficult to form higher visions of human good. Thus, this paper takes the view of claiming that those religious values have their limitations. Rather, we can revoke this view and promote *societal culture* as it is offered by Will Kymlicka (1995).³ His notion of *societal culture* is concerned with a particular kind of culture — "societal culture". He points out some features of *societal culture*: "culture which provides its members with meaningful ways of life across the full range of human activities, including social, educational, religious, recreational, and economic life, encompassing both public and private spheres."⁴

Within this culture, Kymlicka claims that the following occurs: "an intergenerational community, more or less institutionally complete, occupying a given territory or home land, sharing a distinct language history."⁵ From this standpoint, we can easily draw the conclusion that any sort of culture would be meaningful if able to provide a "meaningful life" across the full range of human activities, "including social, educational, religious, recreational, and economic life,

³ See for discussion, Bhuiyan, A S M Anwarullah, 2011. "A Critical Response to Will Kymlicka's View of Multiculturalism", *Human Affairs*, 21, 129–139, Springer, Institute for Research in Social Communication, Slovak Academy of Sciences.

⁴ Kymlicka, W. 1995. *Multicultural Citizenship: a Liberal Theory of Minority Rights*. Oxford: Oxford, University Press, p.76.

⁵ Kymlicka, 1995. p.18.

encompassing both public and private spheres.”⁶ In my consideration, within the framework of *societal culture*, Bangladesh can mitigate all religious controversy to articulate a bioethical policy.

Incorporating *societal culture* in the field of bioethical practices can provide an ad hoc solution to solve religious and other sorts of cultural differences which have appeared as challenges or obstacles to having a flourishing bioethics field in Bangladesh. However, the lack of a multidisciplinary approach is another challenge facing bioethics which is discussed in the next section.

2.1.3 Bioethics Needs a Multidisciplinary Approach

What exactly is the nature of academic curricula in Bangladesh? It is well known that recent academic curricula have been interested in being based on a multidisciplinary approach. Bioethics, as a means of ethical assessment, has been developed in Western countries as multidisciplinary in nature. As such, it incorporates legal, religious, secular and cultural knowledge and knowledge of biological science, theology and social sciences. It also has multidimensional applications such as in the field of healthcare among medical practitioners including nurses, in the case of reproduction and reproductive technology, in issues of family relationships and in the impact of new science and technology. In that sense, bioethics is purely multidisciplinary.

However, if bioethics is considered as interdisciplinary, the question needs to be answered about whether the curricula of higher education in Bangladesh are comparable to that of other Western and some Asian countries. The curricula of technical education such as medical science, biotechnology and biological science lack a multidisciplinary approach. Like other curricula of tertiary education, the bioscience-related curricula have also been articulated in a narrow sense that fails to have a holistic approach to the problems of life. Nevertheless, the “Education Policy 2010” comprises this multidisciplinary approach in the chapter titled “Higher Education”. It indicates that specialized knowledge creates discursiveness in the field of knowledge. Therefore, it sought “increasing interdependency of different branches of knowledge. As a result, science and technology, sociology, literature, arts, economics and other subjects are becoming interdependent. This is added to by inventions of new technologies.”⁷ In the same chapter, the policy paper suggested that some strategies be undertaken for the proper implementation of this objective. As such, it claims that: “*The scope of higher education will include subjects like defense studies, comparative theology, peace and conflict, climate change, etc.*”⁸

However, the reality of higher education is to not implement the policy in terms of its conceptual framework which is why we do not yet have an interdependency approach in different branches of knowledge, including in bioscience. If we want to implement bioethics to regulate the contribution of bioscience, certainly it requires that this area of knowledge be designed from a multidisciplinary approach. We have to take such an approach in the different bioethical committees as has been done in Western countries. Some bioscience-related issues that are faced in Bangladesh are next mentioned in the following test cases in areas such as animal biotechnology, medical science, etc.

Firstly, we can look and consider the problem of animal biotechnology which is a major issue faced by bioscience. In Bangladesh, some technological universities and medical colleges have adopted this area of knowledge from its own perspective but lacking the relevant problems of life. Biotechnology deals with the problems of development of micro-organisms, modifications of food products and improving the quality of plants and animals. For transgenic animal production, it also uses plant and animal tissue culture in order to save plants and animals from extinction and undertakes DNA profiling. Different sorts of biotechnologies have given us an enormous amount of advantages. For example, by using biotechnology, we can produce medicine and nutritious food, and can grow more food both in salinity conditions and on land in stressed and near-drought conditions. Despite these contributions, all forms of biotechnology bring forth different ethical controversies, such as environmental impact, impact on human health, animal welfare and the question of naturalness, or playing with God, all of which require discussion in this regard. Therefore, biotechnology or bioscience are not a separate issue aloof from the society’s values, norms, culture, religion and the interest of human beings and, in addition to environmental interest, deserve due concern.

Therefore, any kind of bioscience needs to incorporate a philosophical, anthropological and normative approach. In Bangladesh, these kinds of bioscience curricula have failed to grasp this multidisciplinary approach to the problem of life. In order to find suitable solutions that have issued from this science, academics, formulators and policy experts need to incorporate various disciplines and areas of study.

Secondly, the next scenario is from the medical curriculum. There are 16 government medical colleges and more than 50 non-governmental medical colleges in Bangladesh none of which are teaching bioethical theories or guidelines to students at undergraduate level. Even the one university that handles postgraduate courses has yet to incorporate a full-fledged bioethical course for its students. Medical students only know about the medical professionals’ oath (particularly Hippocratic Oath). Consequently, bioscience students do not have enough knowledge to understand their moral duty due to the non-multidisciplinary approach taken.

⁶ Kymlicka, 1995. 75.

⁷ NEP, 2010, *National Education Policy 2010*, Ministry of Education, Government of the People’s Republic of Bangladesh, 2010, p.31.

⁸ NEP, 2010, p.32.

Table 2: Place of Bioethics in Education Policy and Medical Code

Ethical Issue: Education Policy⁹ (2010)	Bioethical Issue
Chapter: 1 Under the subtitle of "Education: Aims and Objective", this chapter determines its policy as being to direct towards the "cultivation of human values." It also claims that the policy will help to develop the pupils to "become rational and intellectually accomplished human beings with ethical perceptions ..."	Here is an urge towards ethical aptitude, but no place for ethical response to bioscience-related issues.
Chapter: 10; Medical profession should be more sensitive and they are to be motivated and trained as to work as sensitive and conscientious human beings devoted to the service of humankind. Through medical education, they will be motivated to devote themselves to social and human services.	Assigned ethical commitments of a practitioner are mentioned here. But, in case of some controversies such as the issue of bioethics, seeking permission for end his/her life, are not given emphasis.
Code of Medical Ethics¹⁰ ; Bangladesh Medical and Dental Council, 1983 Ten principles are incorporated in its guidelines. Most of them are related to ethical advice for medical professionals. It determines only the practitioners and health activists' responsibility to the patient.	However, the guideline does not incorporate how medical professionals and health activists are to respond to arising controversies. In fact, in terms of bioethical guidelines, the code of medical ethics has simply wasted some pages.

Our "National Education Policy 2010" has a very light emphasis on the importance of ethical responsibility in dealing with medical science-related problems. The aims and objectives of the chapter titled "Medical, Nursing and Health Education" in this policy paper stated that: "[s]ince medical profession is characteristically more sensitive and is related to the physical, mental sufferings/sickness that concern the issues of life and death, the specialists and general doctors, dentists, nurses, health assistants and workers and health technicians are to be motivated and trained as to work as sensitive and conscientious human beings devoted to the service of mankind."¹¹

⁹ NEP, 2010, chapter 1: "Education: Aims and Objective".

¹⁰ CME, 1983. "Code of Medical Ethics" (hereafter CME), Bangladesh Medical & Dental Council, Council Act XVI of 1980 and Approved by the Council in its meeting held on 24.3. 1983.

¹¹ NEP, 2010, Chap. : 10: "Medical, Nursing and Health Education".

However, this direction is seriously lacking in our medical science and bioscience courses. In this way, guidelines in Bangladesh have failed to grasp bioethics as an ethical policy.

2.2 Bioethics in Governmental Policy?

Policy can play a role as a directive that helps the government to regulate its administrative body. In a relevant field, inaccurate implementation of policy may be declared as being a violation of the law. Therefore, the policy should have inherent laws, values, norms and culture in order for proper regulation of law and order within the state. The question of regulating bioscience requires policy to be incorporated that provides a set of bioethical principles in order to give substance to the law and order of the state. In the 42 years that have passed since its independence, Bangladesh has not yet formulated any policy to regulate the contribution of new sciences and its adverse effect on the society and environment. By looking at several education policy papers in the following table, we find it is quite difficult to conclude that they address anything like bioethical matters.

During the past 42 years, Bangladesh has not yet formulated any coherent health policy. Owing to the lack of a health policy, until 1998, the successive Five Year Plans directed all health-related decisions. In that year, a policy paper was approved by the government: this was very much engaged with the objectives of gaining equity and responsibility for its workers and activists from the health sector. However, the present paper concludes that, in order to ensure effective health care policy as well as to promote the regulation of bioscience, ethical governance and rules need to be incorporated to deal with the controversies that have been raised in the health sectors and also in bioscience.

3. Bioethical Issues in Bangladesh

However, these are the theoretical as well as the empirical challenges that are faced in developing bioethical policy. The field of reproductive medicine and technologies has opened new avenues of possibility for mankind to promote reproductive health. However, these possibilities have, in turn, led to new moral controversy and dilemma. The next section considers some bioethical issues involved within abortion and in-vitro fertilization (IVF). This section also refers to some moral and regulatory frameworks in its attempt to help build the awareness of policy makers and medical practitioners.

3.1. Bioethics in Reproductive Medicine

Here, I use the term "reproductive medicines" as the means which fosters fertility and assisted reproduction. Reproductive medicine plays two divergent roles: firstly, people use reproductive medicine in the case of terminating pregnancies (abortions) for undesired pregnancies; secondly, in order to fulfill people's desire to have children, reproductive medicine provides one means of assisting conception. Another way to increase reproductive choice is to help predict the

health status of a potential child (the fetus). Reproductive medicine has two aspects: the negative aspect discourages assisted reproduction, and the positive aspect fosters reproduction. The positive aspects of reproductive medicine and technologies particularly help the infertile couple to have a child. Recently, even in Bangladesh, a number of technologies are being used for that purpose, for example, artificial insemination for preserving sperm, hormonal treatment for producing eggs and surrogates in the case of the female partner's incapability of bearing an embryo in her womb. Some bioethical issues such as abortion and in-vitro fertilization will be focused in the following sections.

3.1.1 Abortion. As a means of reproductive medicine, abortion is the most controversial issue in Bangladesh. There are many reasons for having an abortion. Sometimes, women have an abortion in order to save their life. Other reasons are to preserve physical and mental health, due to rape or incest, fetal impairment, for economic or social reasons, and due to unexpected or illicit sexual activity. The Bangladesh government only allows abortion in the case of saving the life of the woman.¹² However, under the family planning law, "menstrual regulation" services are also effectively allowed by the government. As a family planning method, menstrual regulation is not treated as an abortifacient; rather, it is available until the fetus is at eight weeks at the patient's request. It seems that menstrual regulation is in contradiction to the restrictive nature of abortion law. Why does contradictory law exist in the prosecuting manual of the state? In response to this question, the state jurist's defense is that the purpose of the law is to prosecute the offense of abortion. But, the fact is that prosecuting the offense of abortion may be unsuccessful only because of menstrual regulation.

However, in the law related to abortion, informed consent does not stand in terms of the agent's autonomy. It has been mentioned in a loose sense that abortion should be carried out with the patient's consent, that this should be on the basis of saving her life and that the decision should be performed by a competent physician with the help of trained paramedics in a specialized hospital. But in actual fact, the reality of the governance of reproductive medicine in Bangladesh, in most cases, faces many problems. It has been reported¹³ that 35% of maternal mortality is the result of induced and unsafe abortion.

Therefore, the question that may arise here is: how can we formulate bioethical guidelines for mitigating the risk-taking in having an abortion? In Bangladesh, bioethical issues have been discussed since the

beginning of the 1980s as an issue of practical ethics in philosophical curricula. In these curricula, Peter Singer's eminent book *Practical Ethics*¹⁴ has become very relevant due to its various topics on equality, abortion, euthanasia, animal rights, wealth and poverty, and political issues such as democracy, civil disobedience, etc. Owing to the influence of Singer on our academic curricula, it is not unusual to formulate bioethical guidelines associated with the views of preference utilitarianism.

The controversies about abortion usually focus on religion, law and political values. Therefore, the questions are common in this respect: should abortion be treated like murder?; and is abortion consistent with religious values? Behind the controversies, more crucial moral questions are lacking the deep concentration that they deserve. The controversy of abortion involves the legal and moral status of the fetus. If exponents consider the fetus to be a person, of course, they may decide that abortion as a murder. On the other hand, abortion should be justified from the perspective of a woman's physical autonomy. The state, society or family cannot pressure women to carry pregnancies and even cannot force them for abortion. Moreover, abortion is an ethical choice when it is related to the agent. Therefore, in order to solve this controversy, we should answer this ethical question: (1) does the agent have moral obligations to the fetus? The question of the bearer's bodily autonomy should also be clearly justified. However, in the context of Bangladesh, a good policy on abortion can only be chosen when it is possible to resolve the controversy between politics and religion. But our state's decision-making is seriously confused by the political and religious dimensions.

3.1.2 In-Vitro Fertilization (IVF). In the case of infertility, wealthy couples who are incapable of having a child due to their infertility do not encounter any problem in receiving IVF or any other assisted reproductive means. However, religious experts have created a psycho-environmental situation in the society through propaganda which is working effectively. Some feminists¹⁵ in Bangladesh have also raised a question about the trend of using contraceptives being dependent on women. This is why only women face a number of adverse side-effects from using contraceptives. For example, irregular menstruation, feeling fatigue and also headaches are common complaints. The means of contraceptives are available for men in Bangladesh. Some scientific experiments have found that the impacts of these new techniques are not as bad as those faced by women.

¹² United Nations, *Abortion Policies: A Global Review*, Bangladesh, 47.

URPL <http://www.un.org/esa/population/abortion/profiles.htm>, accessed 10 Sep 2012.

¹³ BDHS, 2011, Bangladesh Demographic and Health Survey, NIPORT: Mitra and Associates, Demographic and Health Surveys, Macro International Inc., Dhaka.

¹⁴ Singer, Peter, *Practical Ethics*, 1989 (1979), Cambridge: Cambridge University Press.

¹⁵ Begum, Hasna, 2001, "Issues Related to the Implementation of Reproductive Technology in Islamic Societies", in *Ethics in Social Practice*, Dhaka: Academic Press & Publishers Limited. Also see her (2001) "Rights of Woman in Bangladesh"

In the case of women's infertility¹⁶, IVF¹⁷ is used at the suggestion of an expert physician. Receiving the IVF technique is controversial even in the secular world where the question has been asked whether it is ethical to take IVF. In Bangladesh, due to its Islamic orientation, the same question comes to the scenario. It is also argued by some Islamic research associations, particularly *Al-Ghazzali Centre*¹⁸, that there are no clear prescriptions about IVF in the primary religious texts, the *Qur'an* and *Sunnah*. This is why there are five rulings amongst the Islamic jurisprudence. Some exponents say that IVF is permissible; some Islamic jurisprudence says that it is reprehensible; some say that, of course, in the case of natural infertility, the married couple could receive IVF so that it is recommended; some say it is obligatory; and some take a stand that it is strictly prohibited.

In response to this issue, the Bangladeshi Muslim community is also divided into two wings: firstly, the mass of illiterate people, religious personalities and some of the Mowlana (Islamic intellectuals) seriously oppose using any sort of scientific means. They urge that IVF is one of the "sharing" (*shiraaq*) or "playing with God" which is strictly prohibited in Islam. In favor of their argument, they explain that Allah has given *reproductive fluids* to all males and females for producing offspring. In this regard, the *Qur'an* states that "Verily, I created humankind from a small quantity of mingled fluids."¹⁹ Another verse of the *Qur'an* forwarded for refutation of the option of IVF states that: "He bestows both male and females; and He leaves barren whom he Will."²⁰ This means that God is almighty: if His will is to give an offspring, it might be possible even at the age of 80. For example, they mention the story of Zakariah and his wife Isbah who in old age conceived by the blessing of God.²¹

However, another argument in favor of IVF is influenced by the Islamic Fiqh Council. According to Sharee'ah, IVF is possible among married couples, but not in other situations. This view was explored by

Sheikh Ahmed Kutty²²: he argues that IVF is permissible only in the case where both are husband and wife by means of the *Islamic Nikah* (marriage) system. The sperm and egg should be collected from them but if an egg or sperm is introduced from any other person, not tied by marriage (not the husband or wife), it would be adultery (*zina*) in Islam. The same views have been promoted by the Al-Azhar's Fatwa Committee. However, some other radical Muslim scholars have provided an argument under Islamic jurisprudence (Usool al-Fiqh, Fiqh) that Islam is for humankind and also for the benefit of the humanity. They claim, in accordance with this view, that if any new sciences would be beneficial for humanity that should be acceptable. Accordingly, IVF might be beneficial in the case of the inability of a couple to achieve a pregnancy. In all respects, the controversy involving IVF has not yet been solved in Bangladesh from its bioethical aspect.

Some of the contributions of reproductive medicine are coming from biotechnological inventions. The next section focuses on some potential contributions of bioscience: genetic engineering and stem cell research. This section shows that there are an enormous number of ethical issues: it also shows how the Bangladesh government can attempt to grapple with these controversial issues. At the same time, the section also offers some bioethical frameworks to assess their contribution.

3.3 Genetic Engineering and Stem Cell Research

South Asian countries are highly populated. In terms of fulfilling the necessity of food security and alleviating poverty among the majority of the population of these countries, they have concentrated on agriculture and animal protein. Therefore, they have been seriously considering biotechnological innovations as a key component in fulfilling this need. Before entering into discussion on the problem of animal biotechnology, firstly, we have to introduce the animal biotechnology practices in Bangladesh. Then, we will attempt to find out whether the Bangladesh government takes into account bioethical governance in assessing the contributions and diverse impact of animal biotechnology in different fields.

For the last three decades, Bangladesh has undoubtedly been achieving successful improvement in farming systems, agricultural techniques, livestock production, health, nutrition, and gene management. In the late 1970s, Bangladesh initiated a program on plant biotechnology. Recently, some non-governmental organizations (NGOs) and universities have initiated similar programs. Some institutions and NGOs are engaged in biotechnology research but the majority of scientists are trained in conventional biotechnology. There is a need to build the legal, institutional and human capacity so it can cope with the demands and rapid development of modern biotechnology.

¹⁶ I used the term infertility in the sense of Professor Brent Miller, for more details we can see: Miller, Brent, 2004. *Family and Human Development*, Utah State University

¹⁷ IVF (In Vitro Fertilization) is a reproductive technique of fertilization of the embryo by combining the sperm from the male and egg from the female in a laboratory. In a successful procedure, firstly it requires to retrieval of the mature egg. In the second step, the egg should place into an incubator by a culture medium until optimal fertilization by the sperm. This stage is called pre-embryo, then in the third stage, after recovering the egg, the embryo(s) inserted into the uterus through the cervix. Finally, hormones push to regulate and support the early pregnancy.

¹⁸ This centre is contributing in the field of Islamic Sciences and Human development. For this opinion see the booklet: "Ali, Afroz, " The conditional Permissibility of In Vitro Fertilization under Islamic Jurisprudence, *al-ghazzali centre for Islamic Sciences and Human development*, Australia, URL : www.alghazzali.org.

¹⁹ Holy Qur'an, 76:2.

²⁰ *Qur'an*, 51 :28-30.

²¹ *Qur'an*, 21 :89-90.

²² Kutty, Sheikh Ahmed, 2002, IVF Symposium, *Faith and Science*, Toronto, Canada.

Except for livestock husbandry, there is no significant biotechnological application in Bangladesh. Current infrastructure, legal or institutional capacity, technical and financial systems are very low in terms of enhancing biotechnology. Some researchers at the non-governmental level are engaged in biotechnological research. In May 2000, the Bangladesh government officially adopted "bio-safety guidelines" which aim to: "[e]nsure safe transfer, handling, use and trans boundary movement of LMOs to safeguard human and animal health, environment, biodiversity and the socio-economic welfare of the society."²³

In August 2005, the Ministry of Science and Information and Communication Technology, Bangladesh and the National Biotechnology Policy launched a guideline paper for controlling significant improvements in different fields of biotechnology. The section "Goals and Objectives" of the policy emphasizes: "The main goal of the policy is to ensure sustainable development of agriculture-food and other crops; nutrition; health; environments; and livelihood of people, enhance agricultural competitiveness in relation to global standards. The other important goals include strengthening of the national capabilities in modern biotechnology, bio-safety, and bioethics in order to ensure judicious use of this modern tool for socio-economic development of the country."²⁴

In its objectives, the policy report includes 10 aims: within the biotechnology policy report, the understanding of biotechnology, whether it is animal, agricultural or food biotechnology, is centered only for the benefit of human beings and developing their consuming lifestyle: "increased quality and value of products leading to sustained food security, poverty alleviation and health and livelihood improvement."²⁵

In its objectives 3.2.4 to 3.2.7, the policy suggests facilitating the funds for rapid development of [animal] biotechnology. However, in the last section (3.2.10; p.4), the policy very insignificantly mentions a precaution: "to create public awareness on biotechnology by involving all stakeholders to ensure adequate level of protection in the safe handling of this technology."

In the section "Opportunity Areas of Biotechnology in Bangladesh" (p.4), the policy report is ambitious in seeking to achieve: "[S]ubstantial benefits to the society in a wide range of sectors such as agriculture, medical and health and nutrition, forestry, animal husbandry, fisheries and livestock, environment protection and improving the quality of products and services."

On the other hand, the biotechnology policy report has no strong commitment to contributing to a

sustainable lifestyle. Instead, the guidelines report covers the following:

i. "An identification of any novel genotypic and phenotypic characteristics associated with the GMO/LMO that may have adverse effects on biological diversity in the likely potential receiving environment, taking also into account risks to human health,"²⁶

ii. "An evaluation of the likelihood of these adverse effects being realized, taking into account the level and kind of exposure of the likely potential receiving environment to the living modified organism."²⁷

According to the Method of Risk Assessment²⁸, it seems that the guidelines are committed to contributing to the sustainable development of society in health care and from an ecological sense. While taking this commitment into practice, it states that the application of biotechnology is committed to a balanced development of society; it contributes to promoting a healthy ecological situation and to initiatives in the field of self-organization. The guidelines also take into account the direct and indirect ecological consequences of biotechnology's activities; it is committed to a responsible approach to nature, the environment and the welfare of animals as well as to other stakeholders related to this issue.

However, the question which is important to answer in this regard is: how can [animal] biotechnological applications tackle the problem of sustainability? In response to this question, we can mention here some of the points from Section 5.9: "Biosafety and Bioethics"²⁹:

5.9.1: Management of opportunities and challenges of biotechnology viz. productivity, sustainability, biosafety, access, benefit-sharing and trade be ensured through appropriate mechanism."³⁰

5.9.2: Guidelines, acts and regulations will be formulated for development and management of biotechnology, biosafety, bioethics, biodiversity & environment protections to ensure human rights as well as social, cultural, ethical and economic perspectives of the country."³¹

We can raise another question: how do we deal with the problem of animal biotechnology regarding sustainability and public health? There is no specific direction or prescription in the guidelines or even in the policy. Sometimes, it is argued that the issue of sustainability is examining the ethical dilemma of maintaining the value of sustainability. Furthermore, we may raise other questions: is animal biotechnology still sustainable in line with the guidelines of the value of sustainability? What kind of interpretation of sustainability is needed to balance the customers' demand and the public health and environmental problems in this case?

²³ Biosafety Guidelines of Bangladesh, 2005, Ministry of Environment and Forest, Government of the People's Republic of Bangladesh. In my discussion, I will use it as Guidelines.

National Biotechnology Policy, 2005, Ministry of Science and Information and Communication and Technology.

²⁴ National Biotechnology Policy, 2005, p.3.

²⁵ National Biotechnology Policy, 2005, p.3.

²⁶ Guidelines, 2005.3.1.4., Methodology of Risk Assessment, p.9.

²⁷ Guidelines, 2005, 3.1.4., p.9.

²⁸ Guidelines, 2005, pp.9-10.

²⁹ NBP (National Biotechnology Policy), 2005, p. 12.

³⁰ Guidelines, 2005, 2005, p.12.

³¹ Guidelines, 2005, 2005, p.12.

Another problem lies in both the guidelines and the policy report. In the biotechnological application, particularly in the application of animal biotechnology, there are at least four stakeholders or interest groups: treated organisms (animals), producers (farmers), consumers (people) and biota (environment: flora and fauna).³² In relation to these stakeholders, the policy or guidelines report produced by the Bangladesh government has not given any direction on how these problems can be mitigated or on how we measure the adverse effects of animal biotechnology. In order to measure the adverse effects of animal biotechnology, the guideline paper has not explicated any ethical standards or methods. It only focused on the risk and benefit of this technique without going deeper. After going through the guidelines and policy reports, it is firstly noticeable that the Bangladesh government incorporates [animal] biotechnology without any scrutiny of the side-effects of this technology. Secondly, the interests of stakeholders involved in this technology are not well-defined.

Four questions should have been answered earlier while pursuing the guidelines and the policy of animal biotechnology:

1. Is it possible to apply animal biotechnology without following the principles of sustainability?
2. Who will bear the burden and gain the benefit from the contribution of animal biotechnology?
3. Are animals or treated organisms considered within the norms of "animal integrity"?
4. To what extent are the opportunities distributed?

In the guidelines and policy report, these questions are not addressed. The report covers only four points³³: SWOT (i) "S=strengths" and (ii) "W=weaknesses" as internal to the organization, while (iii) "O=opportunities" and (iv) "T=threats" are included as external to the organization. The SWOT analysis of biotechnological application in Bangladesh has shown only two aspects of its application. In the SWOT analysis, the first two factors of internal aspects are positive in enhancing biotechnology. The latter two are concerned about the risks of the technology. Through the factors "strengths" and "weaknesses", the report explored two points:

(a) in order to develop biotechnology, it suggests the use of the enormous resources of animals, aquatic fauna and plants. It also suggests encouraging young scientists and professionals to contribute in the field of biotechnological research. The report mentions the weaknesses of biotechnological research in Bangladesh. It finds that inadequate funding, scarcity of skilled researchers, unavailability of laboratories and

scientific databases, and inappropriateness of purchasing techniques are the main obstacles to the development of animal biotechnology in Bangladesh.

(b) In the draft report, it seems, that the focus has only been half-hearted on many significant issues. In order to increase food safety, security, environmental protection and health, the report suggests developing the techniques and policies of biotechnology.

Both the SWOT points ignored at least two important issues relevant to the application of animal biotechnology. We can introduce this problem by raising questions³⁴:

- i. Does animal biotechnology violate the criteria of "animal welfare"?
- ii. What are the effects of biotechnological application upon the environment?

Firstly, in response to the first question, the concept of *animal welfare* is important. Before answering the first question, we shall first have to make the concept of *animal welfare* clear. The term, *animal welfare*, is used by different types of people, especially by veterinarians, farmers, consumers and politicians. Veterinarians focus on the physical environment such as shelter and feeding; they also need to measure how the animals are coping with the existing environment.³⁵ In addition, there are people who think it is important to maintain the psychological status of animals. They are of the opinion that animals have various psychological states such as fear, frustration and pain, which need to be addressed. This should be taken as part of their primary needs.³⁶ Therefore, it can now be said that the overall physiological and mental well-being of the animals is called "animal welfare". However, application of animal biotechnology affects animal welfare in the following two ways:

(a) By using biotechnology, different kinds of animal drugs and feed additives are produced which have adverse effects on animal health. In genetic rearrangement, either in non-sexual or sexual exchange, or in the laboratory, the unavoidable sufferings of animals are beyond description. One study³⁷ shows that after breeding, farm animals suffer from infections from rotaviruses, which are caused by heavy diarrheal diseases. These viruses damage their intestinal mucosa. The same study gives an example of the experiments conducted on pigs through which they are genetically modified. By inserting additional

³² This kind of stakeholders based analysis is emphasized by Ben Mepham. See for details :

Mepham, T. B., 1996. "Ethical analysis of Food Biotechnologies: An Evaluative Framework," in B. Mepham (ed.), *Food Ethics*, London and New York: Routledge.

³³ April, 2011. In a recent draft paper : "Strategic Action Plan to Implement Biotechnology Policy in Bangladesh" completed by Ministry of Science and Information & Communication Technology. Government of the People's Republic of Bangladesh,

³⁴ I raised these two questions in my Master Thesis and attempt to draw a critical response to these questions. See for details: Thesis "Ethical Challenges of Animal Biotechnology: Application of Ben Mepham's Ethical Matrix", Centre for Applied Ethics, Linköping University, Sweden, available in urn:nbn:se:liu:diva-60923, pp.11-12.

³⁵ cf, I adopted the clarification of the term from Masters Thesis, see urn:nbn:se:liu:diva-60923, pp.11-12. and also see Brom, 1991: 4167-4175.

³⁶ Duncan, 2002:, pp. 643-652

³⁷ BABAS, 1999, *Ethical Aspects of Agricultural Biotechnology*, Bioethical Aspects of Biotechnology in the Agro Food Sector, Cambridge Biomedical Consultants, The Hague, 22.

gene copies for growth hormone into pigs, it is possible to bring forth faster growth of their offspring. But the animals involved in the process suffer from severe arthritis which seriously affects their health.

(b) Application of animal biotechnology involves procedures that can cause different types of suffering for animals. Different sorts of proceedings are related to animal biotechnology. Firstly, it encourages the use of a large number of animals within a limited space, for example, intensive livestock farming. What happens in this kind of farming is made clear by the statement by Peter Singer.³⁸ He opines that life is intolerable for animals under intensive livestock farming. Throughout the year, animals are crowded in a battery cage, or in the case of a breeding sow, they are unable to walk or turn around. There is no way of socializing; sometimes, they are thrown out and killed. All this is evidence of ill-treatment of animals as they are confined within a limited boundary. Animals are also deprived of their necessary ethological and biological needs. In this kind of farming, with its caging, restraining, spacing, breeding, rearing and slaughtering, controlled environmental situations are common phenomena.³⁹

Secondly⁴⁰, in response to question (ii), scientists have put forward different kinds of arguments. A study on "animal biotechnology and the environment" by Krinsky and Wrubel, claims that animal biotechnologies have many environmental benefits. They argue that in the traditional milking system more cows give less milk and occupy more agro-land, more cows also produce more slurry and manure. On the other hand, the use of biotechnology is helpful in reducing the amount of land required; thus, the land can be kept for non-agricultural purposes. Another study has shown that a genetically modified animal generates "low phosphorus manure".⁴¹ Usually, feed phosphorus from animal manure is responsible for the pollution of surface water. Low phosphorus contributes to less pollution. Thus, the use of biotechnology turns into a great environmental benefit.

Biotechnology is multidimensional in nature; therefore, its governance also requires the handling of different stakeholders, that is, farmers, consumers, animals and the environment. Sometimes, the stakeholders are in conflict with each other in facilitating their own profit and interest. For that reason, the contribution of biotechnological applications needs to be managed. In Bangladesh, consciously or unconsciously, we are incorporating different kinds of [animal] biotechnological applications which include livestock farming, food, research in medical and medicinal purposes, etc. In our previous discussion, we have shown that the application of animal biotechnologies has dangerous impacts on health, the

environment and treated organisms. This is the convincing reason that justifies the applications and the need to regulate the applications. We should not receive any contribution whatsoever of biotechnology products without adequate justification. In order to achieve reasonable results from the production of animal biotechnologies, we have to critically justify them and should also enhance their ethical governance. The ethical governance of biotechnology would assist the stakeholders involved the biotechnology.

Euthanasia is slightly different issue from that of the reproductive problems such as abortion and invitro-fertilization. However, both they have similarities in terms of life. Euthanasia, abortion and invitro fertilization deals either amelioration of life or discouraging life. The next section will focus on euthanasia.

3.4 Understanding Euthanasia in Bangladesh

What does the term "euthanasia" mean? The term "euthanasia" simply means mercy killing that is carried out in order to bring a peaceful end to the life of patients who are not able to lead a normal life. Some may be suffering from critical diseases with unbearable pain and have no chance of recovery and others may be in a permanent coma. In such situations, actions to administer some lethal drug (active euthanasia) or the withdrawal of treatment to terminally ill patients (passive euthanasia) have been permitted to bring a peaceful death.

The issue of euthanasia has not yet been discussed at the governmental level in Bangladesh. However, many cases have occurred in hospitals without following any rules or ethical criteria, simply by medical doctors stating that the patient is clinically dead. For example, we may refer here to some cases, such as the withdrawal of life-support systems from famous poet Shamsur Rahman, journalist Nirmol Sen, pop singer Azam Khan, political leader Abdul Matin and numerous other cases that have occurred in our hospitals. From these instances of the withdrawal of life support (passive euthanasia), ethical controversy can be extracted which has not been considered in all of these cases due to the lack of any euthanasia committee at hospital or governmental level.

All these instances raise some moral questions: is it morally right to withdraw patients' life-support systems? Is it permissible to stop medical care, food and other support systems without attempting further efforts such as better treatment? We may criticize the option of continuing treatment: at the same time, we may permit the withdrawal of treatment or food but which one is morally right requires decision.

Of course, the permissibility of euthanasia has deserved assessment of its relevant ethical controversy. In the context of the above-mentioned cases, the question may be raised here about whether the decision of the hospital's medical team is ethically or legally permissible. Some may argue that because a person has the autonomy to live life, this implies that they have the right to end it. On the contrary, some

³⁸ Singer, Peter, 1989. *Evidence to Committee*, 11 Aug, 1989, Australian and New Zealand Federations of Animals Societies, Evidence, 9470.

³⁹ see urn:nbn:se:liu:diva-60923, pp.11-12. and also see Brom, 1991: 4167-4175.

⁴⁰ Krinsky and Wrubel, 1996.

⁴¹ Goloven, et.al. 2001, pp. 741-745.

may argue that it is unethical to take one's own life. In the former case, some countries such as the Netherlands and Belgium have permitted euthanasia. But in the latter case, some other countries consider the attempt to terminate one's life as a punishable offense.

In the context of Bangladesh, the matter is not easy to resolve owing to its diverse religious and social dimensions. For example, in a number of cases that we have observed, the choice of taking life/ ending life or withdrawal of food/life-support systems/medicines has involved family members. Some family members may ask for the continuation of treatment for as long as possible. Some may argue that the decision to prolong a terminal situation would increase the suffering and indignity of the patient. Such conflicting situations among family members require observation from some interesting religious and cultural dimensions. Some people who are not blinded by religion would support a painless death as a dignified one and, therefore, indicate that we should not prolong suffering and pain. On the other hand, orthodox Muslims and Hindus advise to not go against the fate that God had determined for us, in other words, not to play with the God that is letting him/her die. Some other aspects come from the patient's financial condition. Suppose, if the patient's family members wish to prolong his/her life, it will require nursing, medicines and other essential equipment which are very expensive and, to some extent, are consuming time and wasting financial resources. For prolonging the life of terminally ill patients, there is no home palliative care available to administer treatment which is another problem in Bangladesh. Therefore, there is no bioethical or legal procedure to consider in terms of the end of life of terminally ill patients. In addition, doctors and nurses do not have training opportunities available on making decisions in such critical situations.

HIV/AIDS is different from the above issues as it is related to the biological suffering of human beings. As such, this very significant medical issue is also concerned with the perception of ethical treatment. How will the HIV/AIDS patient be treated? And, what kind of ethical issues are required to protect against the spread of epidemics of this disease? All these questions will be the focus of the next section.

3.5 HIV/AIDS and Some Ethical Issues⁴²

The major segment of the population in Bangladesh is Muslims. Muslims, in general, follow the principles of the *Qur'an* as the most sacred way of life. However, these principles do not explicitly expose any means to combat or counteract a dreadful disease like HIV/AIDS. Apart from that, the governmental measures in this regard are not complementary to achieving an effective solution. Against this backdrop, this section, however, intends to seek ways that could help increase

awareness about HIV/AIDS, encourage safe sex practices, eliminate stigmatization, reinforce ethical values and promote compassion.

It may be claimed⁴³ that framing an infectious disease as a security risk lends it a sense of urgency. It is also a way of seeking the extra resources that are associated with traditional (military) concepts of security. In this statement, it does not seem to matter if HIV/AIDS really is a security risk, just that the expectation of framing it in that way is more beneficial in regard to the value of the wanted resources. There is historical evidence of the increased allocation of resources when framing the AIDS problem in terms of security according to Selgelid and Enemark. In other words, they expect the best consequences will arise when the HIV/AIDS problem is framed as a security risk. It seems that they use this conclusion as a way of determining the value of the outcome of the option of framing HIV/AIDS as a security risk.

4. Ways to Mitigate the Challenges: Ethical Formulation

At this level, some ethical outlook which is common to bioethical approaches should be justified. The pervasive ethical notions⁴⁴ are non-maleficence, beneficence, the autonomy of the client and justice. These are the moral principles for handling the various aspects of bioethical problems in various ways and degrees.

We have discussed abortion as a crucial issue of bioethics. Regarding the case of abortion, the moral status of the fetus and the rights of the woman who is carrying the pregnancy are very important ethical issues. In the first case, the controversy related to abortion is whether the fetus is a person or not. If the answer is positive, this requires giving emphasis to the right to life of the fetus. On the other hand, the right possessed by the woman implies her entitlement to choose an abortion. As a person, a woman has the right to decide about or to control her own body and neither the state, society nor anyone else has the right to force her to continue a pregnancy against her will.

Therefore, ethical points such as the right of a woman to choose an alternative termed as 'autonomy' or informed consent, and the moral status of the fetus in terms of personhood are very relevant to abortion. However, socio-religious conditions cannot be discarded from the assessment. For example, in Bangladesh, the fact that the majority of the population is Muslim plays a significant role underlying the formulation of governmental policy. The most liberal views of Islam uphold that after the union between egg and sperm, the zygote formed has become a full individual in the sense of carrying its full human genetic code. Islamic scholars reach consensus that "[f]rom the

⁴³ Selgelid & Enemark, 2008, p. 458.

⁴⁴ This line of ethical principles were first used by Beachump and Childress, 2006. *Principles of Biomedical Ethics* (For references : Beachump, T.L., and Childress, J.F., 2006, *Principles of Biomedical Ethics*, Oxford : Oxford University Press, 394-452.

⁴² Particularly this claim is come from: Selgelid, Michael J., and Enemark, Christian. 2008. "Infectious Diseases, Security and Ethics: The Case of HIV/AIDS". *Bioethics*, 22(9): 457-465; Selgelid & Enemark, 2008, p. 457.

moment a zygote settles inside a woman's body, it deserves a unanimously recognized degree of respect, and a number of legal stipulations, known to all scholars, apply to it."⁴⁵ Islamic scholars agree that when the zygote (*nutfah*) reaches the stage of spirit-breathing, the fetus should receive "sanctity of life". Such condemnation is also narrated in the verses of the *Qur'an*: 6:151 & 81:2. By giving respect to it as the full individual, it is a vice (unethical) to kill the fetus at the said stage. Such a situation is narrated in the *Qur'an* by the term "*ham*" (*Qur'an*: 19:22, 31:14, 46:15) which means the zygote should be protected and carried to term. It implies that the zygote has the active potentiality to become a human being. As such, in addition to comparison with other religious and cultural sects, bioethical policy regarding abortion should be formulated by the government.

Any kind of [bio]technology, whether it is animal or plant, is one of the means by which we live today. Most developed countries in the world have achieved significant technological development so their population can lead lives that are very smooth and easy. For example, most agricultural crops and food are the results of biotechnological development. In Bangladesh, we are also using suitable processes by applying certain biotechnological techniques to production. We are using different techniques for producing plants and crops, natural processes and techniques for creative survival and the building and structure of dwellings which are essential features of our lives. We cannot suddenly reject or oppose these developments. This is the reason why we should be cautious as well as critical in applying or rejecting biotechnological techniques. Therefore, tools need to be selected for better assessment of [bio]technology.

In order to assess the ethical issues raised in the application of biotechnologies in animal, health and food production, the European Union has developed decision-support "ethical tools". For pursuing ethical decision-making, a group of ethical experts has developed a set of ethical tools known as *Ethical Bio-TA*. There are a number of ethical tools in the decision-making framework with the potential to support the work of public policy decision-makers. They are: (i) casuistry; (ii) the COGEM framework; (iii) critical systems heuristics; (iv) the Delphi method; (v) discourse ethics; (vi) ethical codes/guidelines; (vii) ethical matrix; (viii) multi-criteria mapping; (ix) the precautionary principle; (x) principle-based ethics; (xi) risk analysis; and (xii) stakeholder analysis. To formulate "ethical governance" in Bangladesh, Ben Mepham's ethical matrix⁴⁶ would be helpful for the following two reasons:

⁴⁵ Anonymus, The Full Minutes of the Seminar on "Human Life: Its Inception and End as Viewed by Islam", 1985. URL : <http://www.islamset.com/bioethics/incept.html>.

⁴⁶ Ethical Matrix is one of the ethical tools that have developed by T. Ben Mepham and his colleagues from the University of Nottingham. He introduces this matrix for 'rational ethical analysis' with an aim to assess the impact of new technology of food and biotechnology (Mepham, 1996,

Firstly, as an ethical tool, it incorporates Childress and Beauchamp's four principles: (1) non-maleficence, (2) beneficence; (3) autonomy and (4) justice. Whereas the principle of beneficence emphasizes the "practices of good deeds", non-maleficence refers to the "obligations not to inflict harm": the principle of autonomy is the "guiding principle for the recognition of human capacity for self-determination and independence in decision-making"⁴⁷; and the principle of justice is based on two things: (1) fair treatment of all, irrespective of race, color, religion and economic status, and (2) equity in terms of distribution. In Mepham's ethical matrix, the four principles provide trans-cultural, transnational, trans-religious and trans-philosophical frameworks for ethical analysis."⁴⁸ It also, "... suitably translated within the context of food biotechnologies, provides a framework for ethical analysis which should facilitate appropriate public policy-making in democratic societies [in order to assess] the ethical impacts of biotechnologies in the fields of agriculture and food technology."⁴⁹

Secondly, most of the tools, as mentioned before, including Childress and Beauchamp's four principles, are applicable only to the realms of specific problems such as health care, livestock and medicine and in the problems of biological sciences. But Mepham's ethical matrix is applicable to the different fields of biotechnology, and even to social and pedagogical problems.

What should Bangladesh incorporate in its policy to deal with HIV/AIDS? The present authors emphasize justifying "obligatory precautions" against HIV infection. The terms *obligatory* and *precautions* can be separately understood from their etymological sense. As an ethical term, *obligatory* means something which is required or compulsory which also stresses *ought to do*. On the other hand, the term *precaution* means preventive measurement or carefulness which helps the person to *avoid risk or harm*.

Sometimes it is claimed that safe sex, for example, using a condom or abstinence, is the best precaution against any sexually transmitted diseases. HIV transmission is possible through various ways, for example, by using contaminated needles, transfusion

2000a, 2005, 2006). His 'matrix' is a modified version of Tom Beauchamp and Childress's principlism (1979); Mepham, T. B., "Ethical Analysis of Food Biotechnologies: an Evaluative Framework," in B. Mepham (ed.), *Food Ethics*, London and New York: Routledge, 1996, pp. 101–119; Mepham, T. Ben., "A Frameworks For Ethical Analysis of Novel Foods : the Ethical Matrix" , *Journal of Agricultural and Environmental Ethics*, 2000a 12 (2), 165–176; Mepham, T. Ben., "The Role of Food Ethics in Food policy", In *Proceedings of the Natural Society*, 2000b, 59, 609–618; Mepham, T. Ben., Kaiser M, Thorstensen E, Tomkins S and Millar K, *Ethical Matrix Manual* ,LEI, The Hague, 2006. [http://www.ethicaltools.info/content/ET2%20Manual%20EM%20\(Binnenwerk%2045p\).pdf](http://www.ethicaltools.info/content/ET2%20Manual%20EM%20(Binnenwerk%2045p).pdf) (accessed 1 April 2010).

⁴⁷ Bhardwaj, Aditya, 2003, "Global Biotechnology and Internal Governance of Biotechnology", *Asian Biotechnology and Development Review*, ABDR, New Delhi, Vol. 1: 39.

⁴⁸ Mepham, 2000a, p.167.

⁴⁹ Mepham, 2000a, p.167.

of HIV-positive blood, tattoos, bodies piercing, etc. being the most prevalent. The special features of HIV/AIDS with regard to precaution and transmission do not discharge us of our prima facie obligation to avoid spreading this disease. In that case, the practice of safe sex is the best precaution. First and foremost, this is an individual responsibility that can hardly be controlled by legal, religious and conventional obligations. Therefore, people need to always be conscious about the adverse effects of inappropriate use of these means. Therefore, they should use clean needles and other measures in the field of hygiene are also necessary.

Utilitarianism/consequentialism and contractualism have been described as important theories. Why does utilitarianism matter in the case of obligatory precautions against HIV infection. Why? This tricky question is related to the claim of citizens' liberty. For the sake of public health interest, most countries undertake some sort of public health interventions in the case of infectious diseases. These involve isolation, mandatory treatment of infected persons and quarantine. However, these sorts of interventions seriously obstruct people's personal freedom and liberty, for example, a person who follows a special kind of convention or belief that recommends not taking any vaccines, medicines or treatment.

5. Concluding Remarks: Recommendations

Many problems are interlinked with bioethics. However, to properly handle these issues, a qualitative bioethical discourse needs to be formed in different institutions, organizations and hospitals. Bioethical committees can play a significant role in saving the rights of both patients and experimental subjects in scientific research and health care organizations. In the 1960s, most European countries and the United States (USA) formed bioethics committees. In Bangladesh, there are no central ethics committees to provide administrative control over unethical practices. However, we have observed that there have been no bioethical curricula in bioscience: even medical physicians are not aware of the ethical controversies of abortion, ending life, the moral status of the fetus and stem cell research. Almost every medical college and hospital needs a bioethics review committee in order to deal with controversies arising in medical research and hospitals.

Compared to the Western world, Bangladesh has a different set of values and cultural affiliation. The results of this diversity; the structure of the social systems; the cases of abortion, IVF and sterilization; issues of euthanasia; and practices of biotechnological contributions, in turn, give rise to different kinds of bioethical controversy. Such controversies can only be resolved following the countrywide spread of public values and beliefs. However, we should keep in mind that Bangladesh has diversified values, and a diverse ethnic and religious composition; this means that we do not have a coherent set of values. For example, the values of orthodox Muslims and the secular civil community are not less than the differences between

eastern and western countries. To some extent, these differences are as threatening as the groups in conflict. However, in spite of these difficulties in creating public consensus, there are some positive things in our values. Muslims, Hindus, Buddhists and different ethnic communities have particular beliefs which may promote some of the highest values such as respect for life, brotherhood, empathy, social relationships and non-harming virtues. While formulating bioethical guidelines, committees should consider these values. Introducing these existing values of our society into bioethical guidelines could help to draw very interesting conclusions that mitigate the controversies that have arisen in the aforesaid problems. Adopting societal values has some significant advantages. Firstly, it helps to promote public consensus within a known sphere. Secondly, it helps to promote higher human ends.

If we intend to solve the controversy in abortion on the basis of our regional societal values instead of the Western approach of bioethics, we can follow the local knowledge whether it comes from religion, the indigenous sphere or the historical value of heritage. In the case of abortion, the rights of the woman, holiness of sexual conjugation, respect for life (life of the fetus), the mutual understanding of men and women all require consideration. In our local societal values, all sorts of values are present to a large extent.

In order to monitor these values in bioethical guidelines, skilled and multidisciplinary learned people should be co-opted. Religious personalities, doctors, legal experts, philosophers, ethicists and government representatives (skilled officers from relevant ministries) could be included. In the context of Bangladesh, no central ethics committee has yet been established. The Bangladesh Medical Research Council (BMRC) is playing the role of a central ethics committee. Accordingly, ethics review committees have been formed in some government medical colleges and institutions.

The International Centre for Diarrhoeal Diseases Research, Bangladesh (ICDDR) has undertaken research in prospective areas of infectious diseases and bioscience-related problems. This has been possible only because it receives funding from the World Health Organization (WHO). In order to receive research funds, it is an imperative to form an ethics committee. Moreover, different research organizations such as the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), the BMRC and laboratories of different public universities are also conducting research involving the formation of ethics committees. In 2009, some doctors and university teachers formed the Bangladesh Bioethics Society under the auspices of the Regional Unit for Social and Human Science in Asia and the Pacific (RUSHSAP), UNESCO Bangkok and UNESCO Dhaka. In its aims and objectives, the society encapsulates a view that: *"For the advancement of sciences and technology, people are facing dilemmas for ethical issues arising from medicine, biotechnology, environment and social life.*

*In consideration of these, the country demands an urgent need for research, education and implementation of bioethics principles for social development.*⁵⁰

In order to materialize these thoughts, society intends to increase awareness about the adverse effects of biosciences: it also intends to facilitate the formation of governmental policy in moral development. This society has an official journal, the *Bangladesh Journal of Bioethics*, which explicates its bioethical research. However, they do not have any ethical guidelines or prescription on how to form an ethics review committee.

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Ethical Perceptions of Genetically Modified Crops in Malaysia

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Abstract

The development of genetically modified (GM) crops in Malaysia is now closer to the commercialization stage. This is in line with the Malaysian Biotechnology Policy in transforming science into business by 2011. However, the ethical aspects of modern biotechnology have not been taken into consideration while doing the research and development related to modern biotechnology. The objective of this paper is to study the ethical perception of the Malaysian stakeholders in the Klang Valley region towards modern biotechnology in general and GM crops. A survey was carried out on 434 respondents from various stakeholder groups in the Klang Valley region. Results of the survey showed that the respondents were ambivalent and cautious about modern biotechnology and GM crops. Although they perceived modern biotechnology as not threatening the natural order of things and having high benefit, they felt that humans have no absolute right to modify living things, were moderately concerned about its possible risks and were highly concerned about the possibility of market monopoly by giant companies and developed countries. They also stressed the high need for labeling of modern biotechnology products and only had moderate confidence in modern biotechnology regulations.

Perceptions towards the ethical aspects of GM crops were found to vary according to the type of gene transfers involved. GM crops that involve intra-species gene transfer, such as plant to plant gene transfer,

were perceived as more beneficial, less risky and more ethically and religiously acceptable, as compared to those involving cross-species gene transfers. Cross-species gene transfer that was developed for medical-related benefits was more acceptable, compared to those that offered only additional benefits, such as nutritional enhancement.

Key words: Ethical perception, Modern biotechnology, Genetically modified crops, Stakeholders, Malaysia

1. Introduction

Modern biotechnology has the potential to improve plant characteristics, such as resistance to herbicides, pesticides and biotic stress (drought, flood and high temperatures) (Leisinger, 2007; Uzogara, 2000). It has also opened up opportunities to: increase crop yields; reduce crop losses to insects, disease and post-harvest storage problems; and enhance the safety and nutritional value of some crops (Clark et al., 2002; Rollin et al., 2011). Currently, there are two techniques to produce GM crops, which are through genetic engineering or synthetic biology. Genetic engineering involves the extraction of the original gene from the donor to be inserted into the recipient organisms, while synthetic biology involves the gene being made synthetically in the laboratory before insertion into the recipient organisms. These two techniques could transfer the gene across different species of organisms, compared to traditional techniques. The earliest genetic engineering in plants was focused on the management of pesticides (McCullum et al., 2003). The development of GM crops was divided into two generations (Blume & Sorochinsky, 2008). The first generation was the production of GM crops able to resist to herbicides, pesticides and diseases because of viruses, microbes and fungus. The second generation was the production of crops able to resist different kinds of stresses, such as high levels of salt, drought and low temperatures, along with improvement of plant characteristics, such as enhancement of nutritional values, an effective use of the nitrogen cycle, increasing high yields, a better cycle of crops and an effective crop for storage.

In Malaysia there are two major challenges faced in agriculture, which are: the national food safety issues and sufficient production of food supply and production of food and value-added food (Othman et al., 2007). Biotechnology was identified as one of the technologies that can give a solution for the challenges. Genetic engineering is needed to serve as a catalyst to stimulate the growth in Malaysian agriculture, food and agro-based industry (Kamruddin et al., 2007). Areas of genetic engineering of agricultural interest comprise of environmental protection and remediation, food and feed production, medicine and plant-based pharmaceuticals. The National Biotechnology Policy was launched on 28 April 2005, which highlighted nine policy initiatives, including the development of agricultural biotechnology.

By 2010, Malaysia had targeted more than 250 new companies to be able to produce and

⁵⁰ Overview of Bangladesh Bioethics Society, URL: <http://bioethics.org.bd>

commercialize biotechnology products, including agricultural biotechnology products (Abu Dardak & Otheman, 2005). Currently, the Malaysian Agricultural Research and Development Institute (MARDI) has developed more than 50 products related to agricultural biotechnology including papaya, rice, orchid, banana, mangosteen and biosensor kits for pesticide residues (Abu Dardak & Otheman, 2005). On the other hand, genetically modified (GM) palm oil, with high oleic acid content, was under development at the Malaysian Palm Oil Board (MPOB), GM rubber (containing human serum albumin antibody to prevent tooth decay) was developed by the Malaysian Rubber Board (MRB) while GM teak was developed by the Forest Research Institute of Malaysia (FRIM). Evenson (2006) reported that besides rice, papaya, banana, and oil palm, other crops such as pepper, pea/bean, eggplant, melon, pineapple and tobacco were some of the GM crops currently either in the laboratory or greenhouse stage in Malaysia.

In a close step towards the commercialization of GM products, consideration of the ethical aspects related to GM crops and products could not be neglected. Connor & Siegrist (2011) and Rollin et al. (2011) highlighted that moral or ethical views were important factors influencing consumers' perceptions and acceptance towards GM products. Past studies have shown that negative constructs, such as ethical concerns, nature concerns, perceived risks and negative effects of genetic engineering application to humans and the environment affect public reaction towards modern biotechnology applications (Frewer et al., 1995; Blaine et al., 2002). Furthermore, moral concern has been identified as a 'veto' factor for the support of modern biotechnology applications in Europe (Gaskell et al., 2000) and in Malaysia (Amin et al., 2011).

Ethical aspects of biotechnology can be classified into two categories: intrinsic and extrinsic (Comstock, 2000). Intrinsic factors has been associated with the spiritual, cultural, moral, or otherwise personal, beliefs about animals and nature, and the relationship of human beings with animals, while extrinsic factors include health, environmental, economic and social risks (Gott & Monamy, 2004). The extrinsic factors have been covered by many attitude and public acceptance of modern biotechnology. Public acceptance can be understood as the combined attitude of individuals on certain political issues, such as those arising from technological innovations (Aerni 1999). An individual's attitude towards a new technology depends on a number of related factors such as his (or her) perception of its risks and benefits, his socially communicated values and trusts in institutions representing these technologies. With respect to public perception of biotechnology, Kelley (1995) propose that attitude to genetic engineering is determine by the worth of potential benefits offered, knowledge on genetic engineering and having a scientific world-view, minus the perceived risk (rational worries) and anxieties or fears (irrational worries) and plus/minus various minor factors such as background

factors. Other studies also concluded that the public's main concerns about biotechnology are primarily driven by ethical, value and safety concerns (Einsiedel 1997). While according to Hoban (1997), the major influences on acceptance seem to be knowledge level, awareness of benefits, confidence and trust. Gaskell et al. (2000, 2003) used four dimensions of attitude: perceived use, risks, moral acceptability and encouragement to model patterns of European public response to biotechnology.

The studies of public attitude towards biotechnology have many similarities with risk perception studies. Many previous research on public risk perception towards various technologies and food related hazards (Slovic 1992; Sparks & Shepherd 1994; Kirk et al. 2002; Slovic 2004) have adopted the psychometric approach developed by Paul Slovic and colleagues (Fischhoff et al. 1978; Slovic 1987). This approach originated from cognitive psychology was described by Hansen et al. (2003) as the most mature and dominant paradigm in risk perception studies. The psychometric approach suggests that the public did not perceive technological risk according to a single dimension related to predicted injuries or fatalities akin to a risk assessor's viewpoint but interpret risk as a multidimensional concept, concerned with broader qualitative attributes (Rowe 2004). Within this approach, multi-dimensional risk perception is invoked to explain the expert-lay disagreement that is ascribed to lay ignorance in the knowledge deficit model (Hansen et al. 2003). The key variables of risk perception research are the perceived magnitude of risk or dread, risk acceptance, familiarity with the hazard and lately the factor benefit has gained much interest (Rohrmann 1999). Sjoberg (2004) has highlighted the importance of another dimension: 'interference with nature' in risk perception studies on genetic engineering. In this study, the ethical perception of the Malaysian stakeholders in the Klang Valley region towards modern biotechnology in general and specific examples of genetically modified crops will be presented.

2. Methodology

Survey Data Collection

Data for this study was collected by means of a survey carried out from August 2009 until February 2010. The questionnaires were administered directly to 434 adult respondents (over 18 years old) in the Klang Valley region and were stratified according to stakeholder groups. The stakeholders consisted of eleven groups: producers, scientists, policy makers, non-Governmental Organizations (NGOs), the media, religious scholars, university students and consumers. Data analysis was carried out using SPSS version 14.0.

Respondents were asked about their perception of the ethical aspects of modern biotechnology in general and also their ethical perception of four specific examples of modern biotechnology applications/products as follows:

- i. Rice containing a carrot gene to enrich its vitamin A content (Golden rice)

- ii. Banana containing a human albumin gene to produce vaccine for disease (GM banana)
- iii. Rice containing a mouse gene to enrich its vitamin C content (GM rice)
- iv. Rice containing a synthetically-made mouse gene to enrich its vitamin C content (Synthetic rice).

The first product involved plant to plant gene transfer, the second product involved the transfer of a human gene to plant, and the third product involved the transfer of an animal gene to plant, while the mouse gene in the fourth product was developed synthetically in the laboratory before being transferred to the rice.

Instrument

Based on past studies, the multi-dimensional instrument measuring perceptions towards the ethical aspects of modern biotechnology used in this study was constructed. The instrument incorporated seven general ethical aspects which are threatening the natural order of living things (BABAS, 1999; Comstock, 2000; Straughan, 2000; Kaiser, 2005), general concerns (Shrader-Frechette, 2005), human rights to modify living things (Macer, 2005), monopoly by giant companies and developed countries (Tucker & Zilinkas, 2006; Smyth & Phillips, 2003; Bouzenita, 2007; Potrykus, 2001), general promises (Pollara Research & Earncliffe Research and Communications, 2000; Pardo et al., 2002; Zimmerman & Hurrell, 2002), the need for labeling (Taylor & Hefle, 2001; Singh et al., 2006; Herren, 2005) and confidence in biotechnology regulation (Glenn, 2004). It also included five specific ethical aspects: familiarity (Kirk et al., 2002; Weil, 2002; Blume & Sorochinsky, 2008), perceived risks (Rohrmann, 1999; Pollara Research & Earncliffe Research and Communications, 2000; Herren, 2005; Leisinger, 2007), perceived benefits (Persley & Siedow 1999; Macer, 2001), religious and ethical acceptance (Kelley, 1995; Nicholas, 2000). All items were measured on 7-point Likert scales.

Threatening the natural order of living things ($\alpha=0.80$) comprised the average mean response to the following five items: modern biotechnology application is considered as blasphemy; the work of scientists modifying the genetic characteristics of living organisms is considered over the limit; modern biotechnology crosses the natural boundaries between different species of organism; modern biotechnology interferes with natural integrity of living organisms; and modern biotechnology seems to give the same status to living and non-living organisms. Each item was measured on a 7-point scale, ranging from 1 (strongly disagree with the statement) to 7 (strongly agree with the statement). A higher score indicated a greater perceived threat to the natural order of living things.

General concerns ($\alpha=0.85$) comprised four items: modern biotechnology may increase human fatality; modern biotechnology may give rise to unknown diseases; consuming modern biotechnology products may inhibit normal growth among children; and modern biotechnology products may cause transfer of animal disease to humans. Each item was measured on a 7-point scale, ranging from 1 (strongly disagree with the

statement) to 7 (strongly agree with the statement). A higher score indicated a greater perceived risk to human health.

Human rights to modify living things ($\alpha=0.59$) consisted of three items: if animals do not feel pain humans have the right to modify their genetic makeup; the use of animals as modern biotechnology research models is appropriate; and humans have the right to modify living things for the benefit of humans. Each item was measured on a 7-point scale, ranging from 1 (strongly disagree with the statement) to 7 (strongly agree with the statement). A higher score indicated a greater perception of the human's right to modify living things.

Monopoly by giant companies and developed countries ($\alpha=0.86$) included seven items, which were: modern biotechnology may enhance bioterrorism; the modern biotechnology product market is dominated by giant companies; developed countries have a monopoly on the global market of modern biotechnology products; modern biotechnology may cause an economic divide between developed and developing countries; the biotechnology industry needs to be encouraged to patent its biotechnology innovations; intellectual property rights are the best reward to cover modern biotechnology's developmental costs by industry; and a patent is needed to protect the scientist's intellectual property rights. Each item was measured on a 7-point scale, ranging from 1 (strongly disagree with the statement) to 7 (strongly agree with the statement). A higher score indicated a greater perceived monopoly by giant companies and developed countries.

General promise ($\alpha=0.86$) was measured by using the three following items: modern biotechnology can improve Malaysia's economy; modern biotechnology can enhance food quality; and modern biotechnology can reduce starvation in poor countries. Each item was measured on a 7-point scale, ranging from 1 (strongly disagree with the statement) to 7 (strongly agree with the statement). A higher score indicated greater perceived benefits.

The need for labeling ($\alpha=0.87$) was assessed by four items: labeling of biotechnology products is important for those who have allergies against certain foods; labeling is important to provide information regarding modern biotechnology products; labeling is essential to differentiate between genetically modified products and the non-genetically modified products; and labeling of modern biotechnology products is the responsibility of the producer. Each item was measured on a 7-point scale, ranging from 1 (strongly disagree with the statement) to 7 (strongly agree with the statement). A higher score indicated a greater perceived need for labeling.

Confidence in biotechnology regulation ($\alpha=0.75$) comprised three items: the regulation by the relevant authority related to modern biotechnology is adequate; the regulation action on experimental failure of genetically modified organisms is adequate in protecting the safety of Malaysian society; and the government department involved in modern

biotechnology regulation has monitored the safety of modern biotechnology products efficiently. Each item was measured on a 7-point scale, ranging from 1 (strongly disagree with the statement) to 7 (strongly agree with the statement). A higher score indicated a greater level of confidence in biotechnology regulation.

Familiarity ($\alpha=0.74$) was measured by using the three following items: how easy is it for you to know or identify the following modern biotechnology products? ; how easy is it for you to judge whether is it good or bad to consume the following modern biotechnology products?; and are the effects of consuming the following modern biotechnology products well known? Each item was measured on a 7-point scale, ranging from 1 (not easy at all for first two items/strongly disagree for the last item) to 7 (very easy for first two items/ strongly agree for the last item). A higher score indicated a greater familiarity with biotechnology products.

Perceived risks ($\alpha=0.81$) were measured by four items: do you think that the following organism will cause extinction of its original species?; how worried are you about potential risks of the following food to your health?; do you think that any harmful effects from consuming the following food will only manifest itself after long-term duration?; and is there any danger that the following food could cause a major catastrophe to the Malaysian society? Each item was measured on a 7-point scale, ranging from 1 (strongly disagree for other items/not worried at all for item 2) to 7 (strongly agree for other items /very worried for item 2). A higher score indicated greater perceived risks.

Perceived benefits if it is not developed ($\alpha=0.85$) was assessed by the three following items: the potential of the following application to boost the country's economy will be denied if it is not done; the potential of the following applications to improve the quality of the Malaysian society's life will be denied if it is not done; and the potential of the following applications to improve the farmer's and the breeder's life will be denied if it is not done. Each item was measured on a 7-point scale, ranging from 1 (strongly disagree) to 7 (strongly agree). A higher score indicated greater perceived benefits if biotechnology is not developed.

Religious acceptance ($\alpha=0.85$) was measured by two items: the following applications can be accepted by my religion; and the following applications can be accepted by my customs. Each item was measured on a 7-point scale, ranging from 1 (not accepted at all) to 7 (strongly accepted). A higher score indicated greater religious acceptance.

Ethical acceptance ($\alpha=0.88$) comprised four items: more intensive research should be encouraged to develop the following applications; the following applications should be scaled up or commercialized; the government should provide more financial support to researchers and industries in developing the following applications; and how far should the following applications be encouraged? Each item was measured on a 7-point scale, ranging from 1 (strongly disagree)

to 7 (strongly agree). A higher score indicated greater ethical acceptance.

Data Analysis

Initially, reliability tests and confirmatory factor analyses were carried out using SPSS version 14.0 to access the consistency and one-dimensionality of the constructs. Analyses of variances (ANOVAs) were also carried out using the same statistical package.

3. Results

General ethical aspects of modern biotechnology

The stakeholder perception of the general ethical aspects of modern biotechnology were analyzed based on seven dimensions: general promise; threatening the natural order of living things; human rights to modify living things; general concerns; monopoly by giant companies and developed countries; the need for labeling; and confidence in biotechnology regulation. Results of the survey showed that the Klang Valley stakeholders perceived modern biotechnology as having high promise (mean score 5.31 on a scale of 1-7, Table 1). It has the potential to improve the country's economy, enhance food quality and reduce starvation in poor countries.

At the same time, the respondents perceived that: modern biotechnology as moderately threatening to the natural order of living things (mean score 3.76); humans have only a moderate right to modify living things for their benefit (mean score 3.55); and they had moderate concerns about modern biotechnology (mean score 4.59) (Table 1). The integration of novel genes into different species of organisms that crossed the natural boundaries of those organisms were perceived as interfering with the natural integrity of living organisms. The respondents were also highly worried about the possibility of monopoly of the modern biotechnology market by giant companies and the domination of their economy by developed countries (mean score 5.05). The respondents exhibited only moderate confidence in the adequacy of modern biotechnology regulations and efficiency of modern biotechnology monitoring in Malaysia (mean score 4.09) and expressed a high level of need for the proper labeling of modern biotechnology products (mean score of 5.70).

3.1 Specific ethical aspects

Perceptions towards four of the transgenic crops: golden rice, GM banana, GM rice and synthetic rice were analyzed based on five dimensions: familiarity, perceived benefits and risks, religious and ethical acceptance.

Familiarity

Overall, the stakeholders professed not to be very familiar with all the GM crops, as the mean scores were below the mid-point value of 4.0 on a scale of 1-7 (Table 2). Among the four transgenic crops, the stakeholders were found to be slightly more familiar with golden rice, containing carrot gene to enrich its vitamin A content (mean score 3.41), followed by

Table 1: General ethical perceptions of modern biotechnology

Ethical dimensions	Mean score ± std dev.	Interpretation*
General promise	5.31 ± 1.17	high
Threatening natural order of living things	3.76 ± 1.14	moderate
Human rights to modify living things	3.55 ± 1.18	moderate
General concerns	4.59 ± 1.11	moderate
Monopoly by giant companies and developed countries	5.05 ± 1.02	high
The need for labeling	5.70 ± 1.20	high
Confidence in biotechnology regulation	4.09 ± 1.11	moderate

* Mean score 1-2.99 low, 3.0-5.0 moderate, 5.01-7.0 high

Table 2 Familiarity of modern biotechnology products

Stakeholder groups	Golden rice enriched with vitamin A	GM Banana to produce vaccine	GM Rice enriched with vitamin C	Synthetic rice
	*Mean score ± Std. dev	*Mean score ± Std. dev	*Mean score ± Std. dev	*Mean score ± Std. dev
1. Producer (n=25)	3.81 ± 1.47	3.20 ± 1.08	3.09 ± 1.08	3.05 ± 1.10
2. Scientists (n=32)	3.80 ± 1.29	3.95 ± 1.39	3.92 ± 1.55	3.95 ± 1.52
3. Policy makers (n=39)	3.28 ± 1.21	3.04 ± 1.33	3.03 ± 1.11	2.95 ± 1.53
4. NGOs (n=26)	3.69 ± 1.12	3.32 ± 1.18	3.33 ± 1.12	3.44 ± 1.01
5. Media (n=29)	3.80 ± 0.89	3.69 ± 1.11	3.37 ± 1.24	3.41 ± 1.17
6. University students (n=44)	3.44 ± 1.18	3.16 ± 1.05	2.80 ± 1.05	2.83 ± 1.11
7. Islamic scholars (n=43)	2.67 ± 1.30	2.62 ± 1.38	2.53 ± 1.46	2.60 ± 1.42
8. Buddhist scholars (n=32)	3.38 ± 1.23	3.32 ± 1.00	3.07 ± 0.87	3.20 ± 1.04
9. Christian scholars (n=34)	2.97 ± 1.29	2.85 ± 1.18	2.83 ± 1.19	2.80 ± 1.14
10. Hindu scholars (n=34)	3.03 ± 1.21	2.77 ± 1.09	2.51 ± 1.03	2.59 ± 1.04
11. Consumers (n=96)	3.64 ± 1.17	3.42 ± 0.98	3.19 ± 1.04	3.18 ± 1.06
Overall (n=434)	3.41 ± 1.25	3.22 ± 1.19	3.05 ± 1.20	3.07 ± 1.21

* Mean score 1-2.99: low, 3.0-5.0: moderate, 5.01-7.0 high

Table 3 Perceived benefits of modern biotechnology products

Stakeholder groups	Golden rice enriched with vitamin A	GM Banana to produce vaccine	GM Rice enriched with vitamin C	Synthetic rice
	Mean score ± Std. dev	Mean score ± Std. dev	Mean score ± Std. dev	Mean score ± Std. dev
1. Producers (n=25)	4.49 ± 1.33	4.27 ± 1.43	3.32 ± 1.18	3.39 ± 1.17
2. Scientists (n=32)	4.42 ± 1.18	4.51 ± 1.31	4.44 ± 1.37	4.56 ± 1.48
3. Policy makers (n=39)	4.39 ± 1.31	4.11 ± 1.40	3.92 ± 1.35	4.17 ± 1.31
4. NGOs (n=26)	3.86 ± 1.30	3.85 ± 1.34	3.85 ± 1.35	3.71 ± 1.32
5. Media (n=29)	4.18 ± 1.68	4.17 ± 1.03	3.93 ± 1.41	3.97 ± 1.45
6. University students (n=44)	3.74 ± 1.28	3.89 ± 1.12	3.77 ± 1.22	3.73 ± 1.24
7. Islamic scholars (n=43)	3.77 ± 1.73	3.53 ± 1.66	3.33 ± 1.59	3.63 ± 1.61
8. Buddhist scholars (n=32)	3.89 ± 1.15	3.98 ± 0.88	3.89 ± 0.97	3.82 ± 0.91
9. Christian scholars (n=34)	3.47 ± 1.51	3.23 ± 1.36	3.25 ± 1.56	3.34 ± 1.51
10. Hindu scholars (n=34)	4.25 ± 1.31	4.25 ± 1.31	3.86 ± 1.44	4.07 ± 1.29
11. Consumers (n=96)	4.19 ± 1.21	4.00 ± 1.12	3.74 ± 1.10	3.88 ± 0.98
Overall (n=434)	4.06 ± 1.38	3.97 ± 1.30	3.75 ± 1.33	3.85 ± 1.30

* Mean score 1-2.99: low, 3.0-5.0: moderate, 5.01-7.0 high

Table 4 Perceived risks of modern biotechnology products

Stakeholder groups	Golden rice enriched with vitamin A	GM Banana to produce vaccine	GM Rice enriched with vitamin C	Synthetic rice
	Mean score ± Std. dev	Mean score ± Std. dev	Mean score ± Std. dev	Mean score ± Std. dev
1. Producers (n=25)	3.12 ± 1.22	4.04 ± 1.39	4.78 ± 1.23	4.60 ± 1.23
2. Scientists (n=32)	4.27 ± 1.01	4.48 ± 1.06	4.73 ± 1.15	4.79 ± 1.11
3. Policy makers (n=39)	3.88 ± 1.36	4.11 ± 1.38	4.71 ± 1.37	4.51 ± 1.36
4. NGOs (n=26)	3.95 ± 1.32	4.21 ± 1.20	4.43 ± 1.35	4.42 ± 1.33
5. Media (n=29)	3.37 ± 1.48	3.77 ± 1.28	4.86 ± 1.40	4.89 ± 1.41
6. University students (n=44)	4.01 ± 1.08	4.37 ± 1.19	5.12 ± 1.13	5.01 ± 1.11
7. Islamic scholars (n=43)	4.42 ± 1.45	4.88 ± 1.45	5.39 ± 1.30	5.31 ± 1.33
8. Buddhist scholars (n=32)	3.18 ± 1.01	3.81 ± 1.13	3.86 ± 1.07	3.95 ± 1.03
9. Christian scholars (n=34)	4.24 ± 1.55	4.80 ± 1.23	5.31 ± 1.12	5.36 ± 0.98
10. Hindu scholars (n=34)	3.65 ± 1.02	3.65 ± 1.05	4.51 ± 1.09	4.26 ± 1.05
11. Consumers (n=96)	3.82 ± 1.25	4.12 ± 1.30	4.75 ± 1.24	4.71 ± 1.12
Overall (n=434)	3.85 ± 1.31	4.22 ± 1.30	4.79 ± 1.24	4.74 ± 1.23

* Mean score 1-2.99: low, 3.0-5.0: moderate, 5.01-7.0 high

Table 5 Religious acceptance of modern biotechnology products

Stakeholders groups	Golden rice enriched with vitamin A	GM Banana to produce vaccine	GM Rice enriched with vitamin C	Synthetic rice
	Mean score ± std. dev	Mean score ± std. dev	Mean score ± std. dev	Mean score ± std. dev
1. Producers (n=25)	5.30 ± 1.46	4.18 ± 1.63	2.56 ± 1.49	3.04 ± 1.71
2. Scientists (n=32)	5.00 ± 1.15	4.63 ± 1.53	4.17 ± 1.59	4.38 ± 1.50
3. Policy makers (n=39)	5.36 ± 1.32	4.38 ± 1.95	3.18 ± 1.91	3.51 ± 2.02
4. NGOs (n=26)	4.62 ± 1.34	4.08 ± 1.48	3.50 ± 1.91	3.48 ± 1.65
5. Media (n=29)	4.81 ± 1.80	4.12 ± 1.85	2.19 ± 1.56	2.34 ± 1.52
6. University students (n=44)	5.22 ± 1.52	4.52 ± 1.88	3.47 ± 1.81	3.64 ± 1.67
7. Islamic scholars (n=43)	4.70 ± 1.80	3.53 ± 2.00	2.40 ± 1.49	2.66 ± 1.65
8. Buddhist scholars (n=32)	4.61 ± 1.32	4.70 ± 1.40	3.92 ± 1.45	4.36 ± 1.27
9. Christian scholars (n=34)	5.41 ± 1.28	4.66 ± 1.65	3.37 ± 1.52	3.75 ± 1.70
10. Hindu scholars (n=34)	5.09 ± 1.04	4.63 ± 1.26	3.60 ± 1.60	4.26 ± 1.42
11. Consumers (n=96)	5.07 ± 1.36	4.46 ± 1.56	2.89 ± 1.54	3.16 ± 1.49
Overall (n=434)	5.03 ± 1.42	4.37 ± 1.69	3.16 ± 1.70	3.46 ± 1.69

* Mean score 1-2.99: low, 3.0-5.0: moderate, 5.01-7.0 high

banana containing human albumin gene to produce vaccine (mean score 3.22), synthetic rice (mean score 3.07) and the least familiar with rice containing mice gene to enrich its vitamin C (mean score 3.05). For golden rice, the Islamic and Christian scholars claimed to have a low level of familiarity. Besides these two types of scholars, the Hindu scholars had also shown a low level of familiarity towards GM banana. These three groups and the university students were also found to have low levels of familiarity towards the other two products, GM rice containing mice gene C and synthetic rice.

ANOVAs showed significant difference found for familiarity of golden rice ($F=3.81$, $p<0.001$), banana containing human albumin gene to produce vaccine for disease ($F=4.22$, $p<0.001$), rice containing mice gene to enrich rice vitamin C content ($F=4.23$, $p<0.001$), and synthetic rice ($F=4.16$, $p<0.001$). *Post hoc* tests showed that the Islamic scholars have a significantly lower level of familiarity with golden rice and GM banana compared to the consumers and additionally differed with the scientists and the media with respect to GM banana. The Christian and Hindu scholars were also found to have a significantly lower level of familiarity with GM banana compared to the scientists. On the other hand, the scientists were found to be more familiar with rice containing mice gene to enrich its vitamin C content and synthetic rice, as compared to the university students, Islamic and Hindu scholars and additionally differed with the Christian scholars on their familiarity of synthetic rice.

Perceived benefits

Comparing products, GM rice was considered to possess the highest benefits (mean score 4.06) followed by GM banana (mean score 3.97), synthetic rice (mean score 3.85) and the least benefit was attributed to GM rice containing mice gene (mean score 3.75) (Table 3). Comparing stakeholders, GM rice and GM banana were rated as beneficial (mean score above the mid-point value of 4.0) by six groups of stakeholders (the producers, the scientists, the policy makers, the media and the Hindu scholars) (Table 3). For synthetic rice only three groups of

stakeholders ranked its benefits as higher than the mid-point value and for GM rice containing mice gene, only the scientists' rating was above the mid-point value (Table 3).

ANOVAs showed significant differences for the perceived benefits of golden rice ($F=2.08$, $p<0.05$), GM banana ($F=2.75$, $p<0.05$), GM rice ($F=2.27$, $p<0.05$) and synthetic rice ($F=2.43$, $p<0.01$) across stakeholders. However *post hoc* tests could only confirm that the scientists' opinion on the benefits of GM banana, containing human albumin gene to produce vaccine, were significantly higher than the Christian scholars. The differences in the benefit perception of the remaining three GM products across stakeholders were not detected by the *post hoc* tests.

Perceived risks

Comparing products, the rice containing mice gene to enrich its vitamin C content was ranked as the most risky (mean score 4.79), followed by synthetic rice (mean score 4.74), GM banana (mean score 4.22) and golden rice (mean score 3.85) (Table 4). The majority of the stakeholders perceived golden rice, which involved the transfer of a carrot gene into rice, as not risky (mean score below the mid-point value of 4.0), with the exception of the scientists, the university students, and the Islamic and Christian scholars (Table 4). The opposite pattern can be seen with the other three GM products involving cross-species gene transfers, where the majority of the stakeholders ranked GM banana, GM rice and synthetic rice as risky (mean scores above the mid-point value of 4.0) (Table 4). Only three groups of stakeholders, the media, the Buddhist and the Hindu scholars thought GM banana, which involves the transfer of a human gene into banana to produce vaccine, as not risky (mean score below the mid-point value of 4.0). The Buddhist scholars were the only group who claimed GM rice, which involves the transfer of a mouse gene, and synthetic rice as not risky (mean score below the mid-point value of 4.0).

ANOVAS showed significant differences for the perceived risks of golden rice ($F=3.89$, $p<0.001$), GM banana ($F=3.65$, $p<0.001$), GM rice ($F=4.45$, $p<0.001$)

and synthetic rice ($F=4.57$, $p<0.001$) across stakeholders. For golden rice, the Islamic scholars were found to have the highest mean score on perceived risks and *post hoc* tests confirmed that their rating was significantly higher than the producers and the Buddhist scholars. The scientists and the university students were also found to have significantly higher risk rating for golden rice compared to Buddhist scholars, while the opinion of the scientists further differed with the producers. With regard to rice containing mice gene to enrich its vitamin C content, the *post hoc* tests showed that the university students, Islamic scholars and Christian scholars perceived its risk as significantly higher than the Buddhist scholars. The university students and the Christian scholars also perceived the risks of synthetic rice as significantly higher than the Buddhist scholars.

Table 6 Ethical acceptance of modern biotechnology products

Stakeholder groups	Golden rice enriched with vitamin A	GM Banana to produce vaccine	GM rice enriched with vitamin C
	Mean score \pm std. dev	Mean score \pm std. dev	Mean score \pm std. dev
1. Producers (n=25)	5.54 \pm 1.09	4.25 \pm 1.67	3.23 \pm 1.49
2. Scientists (n=32)	5.06 \pm 0.98	5.00 \pm 1.25	4.63 \pm 1.60
3. Policy makers (n=39)	5.03 \pm 1.23	4.25 \pm 1.59	3.55 \pm 1.58
4. NGOs (n=26)	4.30 \pm 1.68	4.12 \pm 1.56	3.74 \pm 1.65
5. Media (n=29)	5.08 \pm 1.88	4.75 \pm 1.57	3.29 \pm 1.58
6. University students (n=44)	4.99 \pm 1.41	4.38 \pm 1.46	3.61 \pm 1.53
7. Islamic scholars (n=43)	4.33 \pm 1.42	3.83 \pm 1.46	3.32 \pm 1.54
8. Buddhist scholars (n=32)	4.82 \pm 1.49	4.94 \pm 1.23	4.27 \pm 1.16
9. Christian scholars (n=34)	4.63 \pm 1.27	4.10 \pm 1.38	3.88 \pm 1.25
10. Hindu scholars (n=34)	5.40 \pm 1.09	5.28 \pm 1.21	4.10 \pm 1.49
11. Consumers (n=96)	5.03 \pm 1.21	4.62 \pm 1.36	3.67 \pm 1.37
Overall (n=434)	4.93 \pm 1.36	4.50 \pm 1.47	3.74 \pm 1.50

* Mean score 1-2.99: low, 3.0-5.0: moderate, 5.01-7.0 high

Religious acceptance

The stakeholders ranked golden rice highly and the most acceptable from their religious perspective (mean score 5.03), followed by GM banana (mean score 4.37), synthetic rice (mean score 3.46) and GM rice (3.16), which were considered as only moderately acceptable (Table 5).

Comparing stakeholder groups, all stakeholders agreed that GM rice was acceptable from their religious point of view (mean score above the mid-point point value of 4.0). As for GM banana, the majority of stakeholders again agreed that it was acceptable from their religious perspectives, with the exception of the Islamic scholars who thought otherwise (Table 5). The opposite scenario could be seen for GM rice and synthetic rice where the majority of the stakeholders rated them as not acceptable due to their religious views (mean score below the mid-point value of 4.0). The scientists were the only group who ranked GM rice, containing mice gene to increase its vitamin C content, as not risky. The Buddhist and Hindu scholars joined the scientists in accepting synthetic rice from their religious perspectives.

ANOVAs showed significant differences on religious acceptance of GM rice ($F=5.14$, $p<0.001$) and

synthetic rice ($F=6.07$, $p<0.001$) across stakeholders. *Post hoc* tests showed that the scientists had the highest mean score for the religious acceptance of GM rice containing mice gene, which differed significantly with the media and Islamic scholars. With regard to synthetic rice, *post hoc* tests again confirmed that the scientists' mean score of religious acceptance were significantly higher than the media, Islamic scholars and consumers. The Buddhist, Hindu and Christian scholars, as well as the university students, were found to be more accepting of synthetic rice from their religious perspectives, compared to the media. The first two religious scholars' opinions on the religious acceptance of synthetic rice further differed with the Islamic scholars and consumers.

Ethical acceptance

Overall, the ethical acceptance of the four GM crops was classified as moderate. The ethical aspects of golden rice was ranked as the most acceptable (mean score 4.93), followed by GM banana (mean score 4.50), synthetic rice (mean score 3.86), and GM rice (mean score 3.74) (Table 6). All stakeholders agreed that the ethical aspects of golden rice were acceptable (mean score above the mid-point value of 4.0), with six groups of stakeholders (the producers, the scientists, the policymakers, the media, the Hindu scholars and the consumers) perceiving that the ethical aspects of golden rice were highly acceptable. The majority of the stakeholders perceived the ethical aspects of GM banana as acceptable, with the exception of the Islamic scholars. The opposite pattern could be seen with GM rice and synthetic rice, where the majority of stakeholders perceived their ethical aspects as unacceptable to them (mean score below the mid-point value of 4.0). Only three groups, the scientists, the Buddhist and Hindu scholars accepted the ethical aspects of GM rice containing mice gene and synthetic rice.

ANOVAs showed that there were significant differences on the ethical acceptance of golden rice ($F=2.75$, $p<0.001$), GM banana ($F=3.51$, $p<0.001$), GM rice ($F=2.89$, $p<0.01$), and synthetic rice ($F=3.80$, $p<0.001$) across stakeholders. The Islamic scholars were noticeably the least accepting of the ethical aspects of golden rice, GM banana, synthetic rice, and the second lowest in accepting the ethical aspects of GM rice. On the other hand, the Hindu scholars seemed to be highly accepting of the ethical aspects of golden rice and GM banana. *Post hoc* tests confirmed that the opinions of the Islamic scholars were lower than the Hindu scholars, with regard to the ethical aspects of all the four GM products surveyed and their opinion differed with the producers as well, with regard to golden rice. The Islamic scholars' opinion of synthetic rice was also found to differ significantly from the scientists and the Buddhist scholars. Even though the producers were the most accepting of the ethical aspects of golden rice, they were the least accepting of the ethical aspects of GM rice containing mice gene and were the second lowest in accepting the ethical aspects of synthetic rice. The producers' view on the

ethical aspects of synthetic rice was found to be significantly lower than the Buddhist scholars.

4. Discussion

Comparison across GM products

The stakeholders in the Klang Valley region claimed to be not very familiar with the four GM products surveyed, with the overall mean scores below the mid-point value of a 4.0 on a scale of 1-7. Golden rice enriched with vitamin A was found to be the most familiar (mean score 3.41), followed by GM banana to produce vaccine (mean score 3.22), synthetic rice (mean score 3.07) and GM rice enriched with vitamin C (mean score 3.05). This finding is not surprising. The world population at large, including those in developed countries, is not very aware about modern biotechnology and its products which have become part of their life. The Taiwanese were reported to eat many GM foods (especially soybean based) but they did not know it (Ganiere et al., 2004) and the American population also did not realize that GM products have been a part of their food (Fritz et al., 2003). Demirci (2008) found that only 49% of his respondents thought they had seen GM foods at supermarkets while shopping and only 41% expressed that they had consumed GM foods.

Results of the survey showed that the Klang Valley stakeholders acknowledged the high potential of modern biotechnology. However, when asked specifically about the benefits of four examples of GM products that involved various types of gene transfers in plants, the Klang Valley stakeholders were not very enthusiastic about the GM products. Only golden rice, which involved the transfer of carrot gene to rice, was rated as beneficial, with mean score 4.06, slightly above the mid-point score of 4.0 on a scale of 1-7. The other three GM products surveyed were regarded as not beneficial, with mean scores below the mid-point value of 4.0. Cross-species gene transfers were not popular among the Klang valley stakeholders, even though the GM products promise benefits, such as the production of vaccine (GM banana) and nutritional value enhancement (GM rice). The use of animal genes such as mice genes was not perceived as beneficial, even when the gene was made synthetically (synthetic rice).

Even though the stakeholders rated modern biotechnology as not threatening the natural order of living things, they felt that humans have no absolute right to modify living things for their benefit and they admitted to having moderate concerns about the impact of modern biotechnology. By using genetic engineering techniques, genes can be transferred to different species of organisms. The integration of novel genes into different species of organisms seemed to cross the natural boundaries of those organisms involved. Thus, it was also perceived as interfering with the natural integrity of living organisms. Kimenju et al. (2005) and Demirci (2008) reported that their respondents thought that GM food was artificial. The GM technology was regarded as akin to tampering with nature (Kimenju et al., 2005). The insertion of novel

genes into organisms could be seen as interfering with original metabolic pathway of the organisms.

Overall, the stakeholders perceived moderate risks for the four modern biotechnology products. GM rice enriched with vitamin C (mean score = 4.79) was ranked as the most risky, followed by synthetic rice (mean score = 4.74), GM banana to produce vaccine (mean score = 4.22) and golden rice enriched with vitamin A (mean score = 3.85). Only the risks associated with golden rice, which involved plant-to-plant gene transfer was rated below the mid-point value of 4.0. The risk ratings of the other three GM products were below the mid-point value of 4.0, meaning that they were categorized as risky. This perception may be due to the gene transfers involved in the organisms. Past studies have shown that gene transfer across different species of organisms was assumed to be more risky than gene transfer across the same species of organism (Macer et al., 2000; Gaskel et al., 2010; Connor and Siegrist, 2010). Hossain et al., (2002) indicated perceived risk is due to the uncertainties towards GM food (GMF) safety and the potential of negative social effects and effects on the environment. There is also high concern among the stakeholders that modern biotechnology could be monopolized by giant companies and developed countries.

In this study, golden rice was shown to be the most acceptable ethically and from the respondents' religious perspectives followed by GM banana, synthetic rice and GM rice enriched with vitamin C. Looking at the mean scores, only two GM products, GM rice and GM banana were rated above the mid-point value of 4.0. Golden rice was considered the most acceptable ethically, and from religious perspectives, due to the involvement of same species gene transfer (plant-to-plant), compared to the other three GM products, which involve cross-species gene transfers. Among the three GM products which involve cross-species gene transfers, GM banana was ranked as more acceptable than GM rice and synthetic rice, due to the medical-related benefits that can be offered by the vaccine produced. This can be seen from the benefits rating, where GM banana was ranked as second in perceived benefits next to golden rice. Past studies have shown that GM products that can offer clear benefits to the consumers were more acceptable (Amin et al., 2011; Gaskell et al., 2000).

The need for modern biotechnology products to be labeled was perceived as high by the Klang Valley stakeholders. The labeling of modern biotechnology products seems essential to differentiate between GM and non-GM products. Moreover, labeling is important to provide information regarding modern biotechnology products. This gives a choice for the consumer whether to choose to consume GM or non-GM products, based on their knowledge and personal perception. The need for labeling might also be related to the risky nature of GM products perceived by the respondents in this study. Most studies (Hursti et al., 2002; Ganiere et al., 2004; Sheikha et al., 2006; Deodhar et al., 2007) showed that the world population strongly agreed that

GMF need to be labeled. Some argued that labeling of GMF is needed, due to the concern for those who have allergies against certain foods (Kimenju et al., 2005; Ganiere et al., 2004). Emiroglu (2002) stated that consumers can be satisfied only if they are correctly and adequately informed, before and after purchase GM products. Thus, it is important to encourage clear, legible, complete, comprehensible and correct labeling.

With respect to regulation, the Klang Valley stakeholders expressed that they were moderately confident regarding biotechnology regulation enforced by the Malaysian government. Abednego et al. (2008) reported that their respondents strongly agreed with the statement: "government should monitor the production of GMOs and all GM products have to register so that the government can monitor the safety of modern biotechnology products efficiently". There is a need to step up public confidence in GMO regulation as confidence in key actors was positively related to public encouragement of GM food (Amin et al., 2011). The suggestion is for the government regulators to be more transparent in carrying out risk assessments of GMOs, as well as having more open dialogues with the stakeholders on GMO regulation issues. When the public feel that their views are being seriously considered by the regulatory bodies, only then will their confidence towards the regulatory bodies be increased.

Comparison across stakeholders

It is rather surprising and worrying that the scientists, producers and policy makers, who were more involved with modern biotechnology activities, claimed not to be so familiar with the GM products mentioned above. Theoretically, this will bring some impact on the development of modern biotechnology in Malaysia. This is due to the main role played by the scientists in producing the GM products and the producers who will commercialize them. Although the traditional role of the scientists is to create new GM products, they also must become responsible scientists in making sure that their products are beneficial and acceptable to society. The same goes for the producers, although their main focus is on making profits, they also have to become responsible citizens by making sure that they are familiar with their products to ensure that the goods they sell are safe for their customers. It is even more important for the policy makers to become familiar with GM products, as they are the ones who regulate GM products and who have the main responsibility to ensure the safety of GM products in Malaysian society.

All stakeholders were in agreement in professing their acceptance of the ethical aspects of golden rice, which involved plant-to-plant gene transfer and from their religious stand point. The majority of them were also accepting of cross-species gene transfer when allied with medical reasons, such as GM banana, which was developed to produce vaccine to fight diseases, but were not accepting of cross-species gene transfers for nutritional enhancement (GM rice and synthetic rice). GM rice and synthetic rice were also perceived as not beneficial and risky by the

majority of stakeholders. More stakeholders also perceived golden rice as beneficial and not risky, followed by GM banana.

The ethical perception pattern among the stakeholders was found to be ambivalent. Looking at the benefits and acceptance, the scientists were found to be more positive towards the GM products surveyed and they were the only group of stakeholders who perceived all the four GM products surveyed as beneficial (mean scores above the mid-point value of 4.0), and rated the religious and ethical aspects of the four GM products as acceptable. However, at the same time, they also perceived that all the GM products surveyed as risky (mean score greater than the mid-point value of 4.0). Torres et al. (2006) stated that the majority of the scientists, policy makers and businessmen in the Philippines perceived agricultural biotechnology in food production as beneficial but at the same time almost half of them acknowledged that there are risks associated with GM crops.

Considering perceived benefits and acceptance, the Hindu scholars were also more positive in their benefit rating of three GM products (golden rice, GM banana and synthetic rice) and professed to accept them from their religious views. They also considered all GM products as ethically acceptable but their risk ratings were similar to the majority of other stakeholders. The Buddhist scholars professed that all the four GM products were not risky and were ethically acceptable, as well as rating three GM products as acceptable from their religious point of view. However, at the same time, they did not perceive all the four GM products as beneficial (mean score below the mid-point value of 4.0). The policy makers, however, regarded three GM products (golden rice, GM banana and synthetic rice) as beneficial, but only ranked golden rice as not risky and their acceptance ratings were similar to the majority of the other stakeholders. Although the NGOs did not see all GM products as beneficial and perceived the three cross-species gene transfers as risky, they did accept golden rice and GM banana ethically and from their religious views. The media perceived golden rice and GM banana as not risky, while their pattern of benefits and acceptance ratings were in tandem with the majority of stakeholders.

All religious scholars had no problem accepting plant-to-plant gene transfers, such as golden rice. Three groups of stakeholders (university students, Islamic and Christian scholars) regarded GM rice, containing mice gene, and synthetic rice as having high risks and not beneficial, besides rating them as not acceptable ethically and from their religious stand point. They also rated golden rice and GM banana as risky and not beneficial. The Islamic scholars were more sensitive on the religious and ethical acceptance of cross-species gene transfers, where they also considered GM banana, which contained human gene as not acceptable. On the other hand, the university students and the Christian scholars were more accepting of GM banana containing human gene to produce vaccine.

5. Conclusion

The stakeholders in the Klang Valley region were found to be cautious and ambivalent in their attitude towards GM technology and their products. Although the stakeholders were not familiar with the four GM products surveyed, they perceived modern biotechnology as not very threatening to the natural order of things and perceived modern biotechnology as having high promise for the improvement of the Malaysian society and economy. At the same time, they felt that humans have no absolute right to modify living things. Modern biotechnology was perceived as giving moderate concerns regarding human health and they were also highly worried about the possibilities of modern biotechnology being monopolized by giant companies and developed countries. They also had only marginal confidence in the GMOs regulation in the country and stressed the high need for modern biotechnology products to be labeled.

Results of this study have revealed that perception of modern biotechnology products by the stakeholders varies according to the types of the gene transfers involved. Same-species gene transfer (plant-to-plant) was more generally accepted on an ethical basis, compared to cross-species gene transfers. However, perceived risks and benefits of the products also influenced the stakeholders' perception. Cross-species gene transfer was found to be more acceptable if there are clear benefits, especially related to medical needs, compared to those that offer additional benefits, such as nutrient enhancement. If animal genes were synthetically produced, the ethical acceptance increased slightly but this was not good enough to warrant acceptance.

Ethical acceptance of GM crops and products should be reflected in the development of modern biotechnology in the future. It is suggested that the scientists, industries and policy makers seriously consider the ethical aspects of GM products before developing new GM products, especially those involving cross-species gene transfers. They should only proceed with the research and development of GM products if the products are well accepted ethically by the consumers. This is to ensure Malaysia's target in transforming science into business can be achieved through the commercialization of GM crops. There is also a need for increased efforts in designing suitable information dissemination strategies for different groups of stakeholders to convey correct and balanced information on modern biotechnology and products to increase familiarity among all stakeholders.

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Ethical Values of Food Safety

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Abstract

Food is the basic need of all living beings. Much food comes from agriculture, animals, birds and fish. The economic condition of the people is revealed through the food they eat. Low safety awareness is seen in the poorer classes. There is change in the eating habits of Indian people due to western influence. Education to lead to a healthy life and greater food safety is necessary.

This paper deals with the safety of food in production, marketing and consumption. Importance is to be given to clean water, milk, vegetables, fruits, meat, safety of cooked and raw food, environmental cleanliness and neatness in kitchen. The role of government and NGOs, the importance of Food Safety and Standards Act of 2006 & its late implementation, banning of harmful edibles, preventing adulteration in various foodstuffs, harm in using chemicals in food stuffs, problems in implementation of the Act, consumers' role, importance of ethical values in food safety, role of media, consumer awareness and training programmes for officials, poor life style of the slum and village people due to poverty, ignorance and illiteracy, personal hygiene, different types of eating joints, absence of food safety, remedial measures, importance of home food etc., are also to be dealt with. The National Food Security Act passed on 31 August, 2013 will come in to force soon. It is an improvement over the previous act.

Key Words: Food Safety; Ethics; Regulations; Adulteration.

1. Introduction

Food ranks first in the three basic needs of the people. Everyone needs food, in adequate quantity and of adequate quality, to survive and maintain health. India is a developing country and majority of the people do not even have one full meal a day. Even what they take cannot be guaranteed for safety. Clean drinking water and foodstuff should be available to the marginalized people of the society. What little food they could get, should be clean and neat. Ethics should be followed in production and distribution of food at home and outside.

In India, in past years, the best bride was the best cook. One who satisfied the pallet was considered to be a worthy person in a family. But the trend is changing. No doubt Indians are good cooks and love good food. Men also know to cook. *Mahabharatha*, an Indian epic makes mention of the two best men cooks Nala and Bheema. This paper analyses the need for safe and sufficient food for all; the role of NGOs and Government in dealing with the production and distribution of safe food and food materials; especially to the slum and village people; ethical values to be followed by the producers and consumers and remedial measures. The legal measures taken by the Government can strengthen the concept of food safety.

2. Food Practices

Food practices of rich and upper middle classes have changed a lot. As in most of the nuclear families both the parents go for job with no elderly persons at home, easy and fast food have taken a lead. The Fast Food joints are very handy for such families. But it is to be found out, how clean these shops are and the quality of the food available there. The neatness of the servers and cleaners is very important. The poorer section of the society face hurdles due to their economic condition. Especially poor men, slog and get wages but soon a major part goes for liquor and cheap

food. Women also work hard for the family. Slums and villages lack hygienic environments.

3. Food Availability

India is a thickly populated agricultural country. Many live below the poverty line. Poverty and illiteracy cause ill health. Unemployment and under employment affect the poorer class. Lack of basic sanitation causes diseases. They could not even have one square meal a day which reflects on their health. Many of them do not even know about food safety. Obesity is very common among the richer sections of the society, because of fatty food. The middle class is able to manage food, but safety of their food is questionable. Food practices of earlier generations slowly give way to new. Younger generation has switched over to fast food and road side joints which are not safe.

4. Food safety

Food safety is a scientific discipline describing handling, preparation, and storage of food in ways that prevent food borne illness. This includes a number of routines that should be followed to avoid severe health hazards. Food safety does not mean the safety of home food alone it also means safety between industry and the market and between the market and the consumer. In considering industry to market practices, food safety considerations include the origins of food including the practices relating to food labeling, food hygiene, food additives and pesticide residues, as well as policies on biotechnology and food and guidelines for the management of governmental import and export, inspection and certification systems for foods. In considering market to consumer practices, the usual thought is that food ought to be safe in the market and the concern is safe delivery and preparation of the food for the consumer.

5. Facts about food

Survival is impossible without food. Different kinds of food are available at home as well as outside. The financial condition of a person could be known from the food one eats. Food must be tasty, of good quality and safe. There are innumerable hotels suitable to the financial condition of the eaters. Poor go for cheap joints for cheap food. Rich go to higher standards, the middle class visit generally average standard hotels and occasionally big ones. The western contacts and influence have brought new recipes. But there is no equals to hygienically made home food.

Safe food should be nutritious and supply energy to the consumer. Unsafe food can cause ill health and transmit disease from person to person as well as serve as a growth medium for bacteria that can cause food poisoning. In developed countries there are intricate standards for food preparation, whereas in lesser developed countries the main issue is simply the availability of adequate safe water, which is usually a critical item (Shiklomanov, I. A. (2000), "Appraisal and Assessment of World Water Resources". *Water International* 25 (1). International Water Resources Association. pp. 11–32.)

To help the poorer students in schools in Tamil nadu, the Midday Meal Scheme was introduced. Each child is given free food not only to feed them but to

reduce dropouts in schools. Many parents send their children to school to get one square meal. On the darker side, there are complaints about distribution of unsafe food with rotten vegetables in an unhygienic environment. Periodical check up of the standard of cooked food, neatness of the dining hall and kitchen and strict action against the defaulters are important.

6. Regulations

The Government of India passed the Prevention of Food Adulteration Act and Rules in 1954 with an aim to ensure unadulterated food availability. The Act and Rules has prescribed some minimum standards which are to be followed *scrupulously* by the vendors. Later the Central Government enacted the Food Safety and Standards Act, 2006 (34 of 2006) and it has come into force throughout the country on 5th August 2011 by repealing the Prevention of Food Adulteration Act 1954 and seven other orders specified in the Second Schedule of the Act 34 of 2006. It insisted that all traders engaged in food business conformed to the provisions of the Act. Following that, the Tamil nadu Government brought Food Safety and Drug Control under one administration called the Food Safety and Drug Control Administration Department. Necessary officials are appointed and training was given to officials.

7. Functions of the Department:

The functions of the department would include taking steps to ensure that food supplied to people is safe, issuing licenses to micro and small traders and other commercial establishments engaged in food business, preventing sale of food products hazardous to public health, creating awareness of food safety and conducting surveillance. To get the Food Business Operator license, all restaurants and hotels, snack bars, cafes, school and office cafeterias, and cafes within hospitals have to comply with a series of stringent guidelines including specific hygiene practices.

The Commission of Food Safety, Tamil nadu has arranged orientation training for the Food Safety Officers in ten batches. The training for the first batch was inaugurated by the Commissioner on 28.01.2013 in the Institute of Public Health, Poonamali in Chennai, Tamilnadu. To receive complaints from the Public / Food Business Operators, a helpline has been created. Any complaints under this act can be made to the Office of the Commissioner of Food Safety in Chennai, the State capital.

The Food Safety and Standards Authority of India (FSSAI) has proposed to lay down a trap to intercept manufacturers involved in production or marketing of adulterated food items. To encourage inflow of information from all stakeholders regarding adulterated/unsafe food, the FSSAI has proposed to introduce a scheme of rewards for whistle-blowers and informants from the funds being made available to the state governments under a Centrally Sponsored Scheme (*Unavulagam*—Food Safety). In this regard, Section 95 of the Food Safety and Standards Act, 2006, has a provision for rewards to be given to the

whistle-blowers who provide any relevant information on food adulteration

8. Commitments of the Food & Food Materials Producers

All commercial establishments and traders engaged in food business should obtain licenses under the Act to start or continue their trade. The traders should ensure quality and hygiene in the food sold by them. The premises of the food establishments should be safe and hygienic.

They should not sell food products past their expiry dates, adulterated, sub-standard or banned food products.. Employees engaged by them should maintain hygiene.

9. Details in packages of food and food materials

Each packed food item should contain the mandatory label declarations printed on it, as required by the Prevention Of Food Adulteration Act,1954. If it is not there, the officials have the right to confiscate such food packets. The details needed are the following:

- The name, trade name or description of food contained in the package
- The name of the ingredients used in the product
- A distinctive Batch Number
- The month and year in which the commodity is manufactured
- The month and year up to which the product is best for consumption
- Vegetarian Food symbol (if it is vegetarian food).

10. Drinking Water

Water is the prime need of the people. The poor fill up their hunger with water if they could not afford food. But due to climate change, construction of multi storied buildings etc., there arose the scarcity of water. Drinking water is in much demand. People pay for drinking water. Village women walk long distance to fetch water and in the urban slums, women wait for metro water in lorries or open pumps to get water. The safety of such water is questionable. As the sewage pipes and drinking water pipes in cities and towns are laid under ground side by side, if there is any damage to one, water gets polluted, especially in the rainy seasons. Adequate precaution is to be taken by the local authorities in the supply of safe drinking water.

Due to utter necessity, many drinking water manufacturing package units have been started in India. These units are expected to supply clean unpolluted safe drinking water to public on payment in sealed cans and bottles. It has become a lucrative business in cities and towns. These units are to be approved by the Bureau of Indian Standards (BIS). (*The Hindu*, 17 January, 2013). Knowing the utter need of drinking water, the package units started selling water in plastic covers also for one rupee. Even the village and slum dwellers buy these water covers to quench their thirst. During festivals, the water packets are in great demand. But the safety of the water is questionable. The public are not aware of the distinction between approved and unapproved companies and often buy the cheaper products. There should not be any compromise in allowing the fake units to supply drinking water as it reflects on the

health of the consumer. Many unlicensed units which cheated the public with unsafe water were banned.

11. Banned Products

The government bans the products which are injurious to health. Use of betel leaves may be good for health. But *panmasala* and *gutkha* containing tobacco as ingredient are very harmful. People who use these become addicts. Ultimately, they end up with cancer.

The Tamil nadu State Tobacco Control Cell had submitted a proposal for a ban on *gutkha* and *pan masala* as early as in 2001, but the measure was bogged down in litigation. The government had then invoked the Prevention of Food Adulteration Act for notifying a five-year ban, but the Supreme Court ruled that only the Centre had the power to issue such notifications under the law. The ill effect of using these products was realized by the State Government. Especially the poorer section of the society suffered a lot. Hence, to prevent its use, the Chief Minister of Tamilnadu on 08.05.2013 has announced in the State Assembly that the manufacture, storage, sale, distribution of *panmasala* and *gutkha* containing tobacco as ingredient will be banned in Tamilnadu. Based on the announcement, the Tamilnadu Commissioner of Food Safety and Drug Administration Department has given a circular to his subordinates for better legal implementation of the plan. However, what makes the present ban legally tenable is that it relies on the Food Safety and Standards Act, which has provisions to prevent tobacco and nicotine from being used as ingredients in any food product. The State Food Safety Wing and the Tobacco Control Cell are likely to implement the ban. It was welcomed by the anti-tobacco groups in the State like Adyar Cancer Institute.

The ban will be now implemented under the provisions of the Food Safety and Standards Act, which specifically states that no food product should contain tobacco and nicotine as ingredients. Besides running the risk of having their products seized by officials, offenders have to face between six months to three years in jail. Officials in the State say that the implementation will be done jointly by the office of the Food Commissioner and the State Tobacco Control Cell.

Madhya Pradesh was the first to ban *gutkha* and *pan masala* after the rules and regulations under the Food Safety and Standards Act were notified. Kerala, Gujarat and Mizoram followed soon. West Bengal joined the group very recently. In spite of the Regulation, the chewing items continue to be used by many. Unless one makes up his own mind, knowing the harm it would cause, nothing could change the practice.

12. Ethical Values of South Indian Food:

Contrary to the use of *pan masala* and *gutkha*, the South Indian practice of taking *tambulam* (fresh betel leaves and pasty calcium with areca nut) after a good meal helps a lot in digestion of food taken. It has no addiction like tobacco.

The Sage of Kanchi Sri Sankaracharya has analysed the daily food taken by the vegetarian South

Indians and its ethical values. The meal taken with cooked rice (*sadam*) (i.e) *kuzhambu* (gravy), *rasam* (juice or soup) and butter milk reminds Hindu spiritual path from confused inaction to a clear flow of action and finally to the realized bliss of unity. A feast or get together or function will be complete only after all the guests taking *tambulam* . It signifies a contented meal, hospitality, friendly get together, sharing and a digestive component after a heavy meal. (Ra. Ganapathy., *Sollinn Selvar Sri Kanvhi Munivar*(The Sage of Kanchi ,the Expert of Words).

13. Food Poisoning

There are various tests conducted by experts in laboratories to detect food adulteration (Wikipedia-Adulterated food). If found guilty, the defaulters are punished. Food should be prepared and consumed in a healthy and hygienic atmosphere. Basic cleanliness is to be followed not only by the cook and server but also by the consumer. The kitchen and cooking appliances and materials should be neatly washed. Use of rotten vegetables, fruits, milk, old stuff cause food poisoning. Proper lids are to be used to cover the food. Old and rotten food should not be eaten. Lot of cases of food poisoning in slums and villages are due to consuming bad food. By following personal hygiene and environmental cleanliness, food poisoning could be averted. In theory, food poisoning is 100% preventable. The five key principles of food hygiene, according to WHO, are the following: ("Prevention of foodborne disease: Five keys to safer food". World Health Organisation. Retrieved 2010-12-10)

1. Prevent contaminating food with [pathogens](#) spreading from people, pets, and pests.
2. Separate raw and cooked foods to prevent contaminating the cooked foods.
3. Cook foods for the appropriate length of time and at the appropriate temperature to kill pathogens.
4. Store food at the proper temperature.
5. Do use safe water and cooked materials.

14. Food Business

Nowadays food is available everywhere. There are different kinds of hotels –Five Star Hotels to road side joints or Meals on Wheels. As it is done as a business, the owners should follow some ethics in producing, displaying, marketing, distributing and packing the products. They are to adhere to the rules and regulations of the government without choosing short cuts to gain profit or evade tax. Food Safety and Standards Act of 2006 insists on the registration of the food business units under this Act. It is sad to note that most units are yet to register and they function illegally (*The Hindu*, 17 Jan, 2013).

15. Ration Shops

Ration shops are great boon to the poor as they get food materials, kerosene at a cheaper rate. But a deeper survey shows that the things are not be available through out the month; or bags of rice, sugar, kerosene, dal, palm oil etc are be sold by the ration shop people to retail shops in bulk; sometimes the quality of the things are not up to the mark. Use of low quality materials will cause sickness too. As most of

the buyers are poor people, good and safe products are to be distributed. Any one who questions the ration shop about these mishaps will not be given proper attention thereafter. Periodical inspection of the officials and checking the quality of the materials will be helpful to the buyers.

16. Adulteration

It is sickening to notice adulteration in almost all products. The defaulters show good samples but sell low quality. Some shops use faulty weighing machines, Some adulterated products are given below.

16.1. Idli batter

The most favoured breakfast items of the South Indians are *dosa* and *idli*. Prepared with the batter of ground rice and *dal*. South Indians were preparing them in stoneware instrument called *wural* (manually operated grinder) till last two decades. Then came the wet grinders, table-top grinders and many more sophisticated grinders. Refrigerator helps to store the batter prepared in wet grinders, for a week. In the *wural* periods, the batter was prepared freshly and kept for maximum two days. This home made preparation was clean and safe. The mechanization is not very safe.

As women now buy the batter from shops which produce large quantity of batter, the safety of the product is not guaranteed. It has to withstand climatic and storage conditions. The quality also depends on the personal hygiene of the food handlers, the quality of the rice and water used condition of the grinder too.

A Chennai based NGO namely 'CONCERT' conducted a survey and found that more than half of samples of batter – branded and not – bought from different shops contained bacteria associated with faecal matter. Most samples answered the tests for the presence of hydrogen sulphide producing bacteria in it. This could cause food poisoning.

This drew the attention of the Government to look into the quality of the batter throughout the State. Massive raids were conducted throughout the state on 14.02.2011 to check the quality of the idli-dosa wet flour. Another unit functioned without license and the officials seized 164 kg of unhygienic batter prepared by it. FSSAI has to carry out special vigilance during festive occasions like Diwali, Pongal as the crowd is attracted towards all food items with out knowing the safety of the same.

16.2. Milk

Milk is important for all, from children to elders. The White Revolution has made easy access to milk. Both private and government organizations are engaged in collecting and selling milk and milk products. As milk is a much needed commodity and it loses its quality in no time, it should be supplied safely to the consumers. Different varieties of milk are in the market. Though the officials check the quality of the milk adulteration continues in many ways.

To check milk adulteration and create awareness amongst people, the Food and Drug Administration (FDA) launched a month-long awareness campaign from the World Milk Day (*Zee News*, June 01, 2012, 16:14).

A report by the FSSAI in January 2013 found that most of the country's milk was watered down or adulterated with products -- including fertilizer, bleach and detergent -- used to thicken the milk and help to give it a white, frothy appearance. India is the world's largest milk producer, where the drink is used for religious rituals and is a source of protein for hundreds of millions of vegetarians. FSSAI has also found that 13 percent of all food in India failed to meet its standards. It is the duty of the officials to stop adulteration in food items, especially in milk.

16.3. Tea

Indian tea is of high quality and very much needed in foreign countries. It earns good foreign exchange. But some exporters do not follow business and food ethics in supplying the same sample quality shown to the buyers. It becomes very embarrassing to the government when such illegal activities are processed by the exporters. After passing of the Act, importers can be better assured about the quality of Indian tea. The Tea Board of India has put in place a system of random testing of teas meant for exports to ensure that only the varieties that comply with the standards set by Food Safety & Standard Authority of India should enter global markets.

This measure comes at a time when Indian tea is facing competition in the world market from Kenyan tea. (22 June 2013). Greedy manufacturers compromise with quality which results in low quality of food and in turn, bad health. If they follow some ethical standards, India could feel proud of her merchandise.

16.4. Papad & Toor dal:

Periodical checkups and surprise inspections also take place after the passing of the Act. Many shops are visited and products checked by the officials. Health Officers too check hotels and food products in shops.

Once the officials visited a provision shop in a city and found the *papad* packets did not have the mandatory data on the cover of the pack. The *papad* packets were taken as food sample and sent for analysis to the state owned Food Analysis Laboratory. Upon analysis, the *papad* packets were found to be manufactured in violation of Rule 32(a),(b),(e),(f),(i)&42zzz(17) of the Prevention of Food Adulteration Rules,1955. Hence, the sample was reported to be misbranded. The sellers of those *papads* faced imprisonment (*The Hindu*, 3 Nov., 2012, Madurai). The same thing happened in another shop for *toor dal* packet. (*The Hindu*, 14 March 2013).

16.5. The Apple Story: A Case Study

Fruits are perishable goods and the sellers are cautious that they do not meet with any loss. Hence when they buy loads of apples, mangoes, etc from far off places, they use chemicals for keeping them in good condition during transport and to ripen. But such fruits are not good for health. The details collected from fruit sellers give a shock to the researcher.

The following is a case study of a fruit seller. There are similar cases from all over India. Before dawn every day Bhim joins hundreds of wholesale traders at Delhi's Azadpur Mandi, a sprawling, chaotic market where trucks loaded with fruits and vegetables. His

own trade is in rosy red apples, laced with calcium carbide. Traders cannot buy fruits such as apples or mangoes when they are already ripe, because these would go to waste during the bumpy, un-refrigerated journey from the orchards. Instead, they buy the fruits and later ripen them with calcium carbide, a substance colloquially known as "masala," or "spice." Using the white powder reduces a ripening process that normally takes weeks to a matter of hours. Traders are also tempted to polish or dip fruit in artificial colors to make its appearance fresh for sale. The ones that shine are the rotten ones. They look good to the eyes, but end up bad for the stomach.

Bhim says he has been adding chemicals to his apples for years to artificially ripen them after a long journey from the Himalayan foothills, despite being told that it causes cancer. As far as he knows, no-one has ever died from eating his produce. So he can not understand why the authorities are pestering him now, and why he has to pay so many bribes to keep his business afloat. Wider enquiries proved that this practice will continue for ever as no one wants to harm his sales, although the Food Safety and Standards Authority of India (FSSAI) has banned the use of calcium carbide as it is carcinogenic. Officials also leave it unnoticed as they know that they could not stop the practice. They also accept bribes.

It is not the case with apple alone. To ripen costly mangoes in various parts of India, this practice is being followed. Actually, it results in unsafe and less tasty fruits. Same thing is with vegetables grown with chemical fertilizers. Very few go for organic things. Research on these food products prove that the use of chemicals results in various diseases, especially cancer. From rat poison found in vegetables and Diwali festival sweets laced with caustic soda, to batches of moonshine liquor that kill scores of people at a time are samples of unsafe practices to preserve food items. If people are keen on food safety, correct measures are to be followed with what they consume.

17. Safety Awareness

It is the duty of the parents and teachers to inculcate in the minds of the children the importance of safe food, healthy environment and hygienic practices in day to day life. Even a simple meal should be neat and safe. Outside food kept in bad condition cause sickness and food poisoning. Hand wash is important before and after food. Vessels are to be clean. Fresh food is to be consumed. Food kept in refrigerator for many days should not be eaten. Clean drinking water is a must for good health.

Adulteration is to be avoided. Poverty tempts sellers to add dilutants such as water to make more quantity. Cheap cooking oil is mixed with expensive oil, tea waste is mixed with new tea, and anything from urea to blotting paper is added to thicken the food sold at festivals.

In 2008 in China six children died and nearly 300,000 fell ill from drinking powdered milk laced with melamine, an industrial chemical used to give misleadingly high readings in protein tests. Two people were executed in 2009 for their role in the scandal.

Such severe measures are not followed in India. Corruption and bribery help the defaulters to carry on their food business successfully. Food safety is often worse in poorer areas where ignorance and the temptation to make a quick buck are greater. Poor people do not care much about the quality. Whatever is cheaper, they will buy it. Better awareness needs to be created among them on food safety.

18. Problems of Enforcement

The State and Central governments enact many laws for food safety. The laws are good, but the implementation is very weak. Enforcing India's food safety laws is a tough task. Enforcement officials are not sufficient in number and action. Clever traders come out easily through loopholes. Bribery and corruption make matters worse. Many eating joints have not registered. Even assessing the scale of India's food safety problem has been controversial. After the FSSAI published its survey on milk adulteration, many State governments spoke out to deny the scale of the problem in their region. Some times the food samples given to the lab for test may not be the real ones. Clever and greedy manufacturers cheat the lab and officials in no time. Even found guilty, they know to come out. FSSAI is still in the process of upgrading laboratories with modern technology and training its staff.

19. Conclusion

Despite all mishaps, India's food safety record is much better than yester years, largely because there is a growing awareness of the issue. Indians are becoming more safety conscious thanks to higher literacy rates, licensing, clearer food packaging and a modernizing of retail sector. Media also can play a great role in exposing the defaulters as well the government. Basic ethical values of food safety are to be followed in production, marketing and consumption of food and food materials.

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Issues of research ethics in developing world: Ways of improving the scenario

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Abstract

Although it is a matter of fact that clinical trials and research play a very important role in the scientific and technological development, however, it also gives birth to many ethical problems and dilemmas specially when these research and trials are conducted in developing or resource poor countries. The sponsors and investigators could prefer to perform research in

underdeveloped countries where there is lack of basic resources; people are illiterate and are most susceptible to exploitation. These research give birth to many ethical and moral issues. This paper attempts to discuss some of these issues in detail like; potential for exploitation of research participants, standard of care debates, quality of informed consent, therapeutic misconception and conflict of interest issues. All of them lead to the violation of very basic ethical principles of autonomy, beneficence, non-maleficence and justice. Many interventions could be implemented and the guidelines mentioned in this paper could be followed by the research enterprise to make the studies moral and ethical.

Key words: Ethical issues, clinical trials, research, developing countries, research ethics

Introduction

The significance of new research and clinical or community based trials is high and this is a known fact that it makes addition in scientific knowledge, thus helping to improve the quality of lives. On the other hand, researchers and funding agencies have been interested in carrying out research that include public health research and clinical studies/trials in the developing nations. The poor countries where there is lack of basic resources; people are illiterate and are most susceptible to exploitation are the places where most of the studies are executed. It is easier to conduct the research in these resource poor countries as it consumes less cost for research, participants are easily recruited, it is much easier to implement the study in these countries and finally in the case of clinical trials; the new drug under investigation could be approved easily. All these factors raise many ethical issues when the research are conducted in developing parts of the world.

This paper attempts to discuss these issues that arise when such research are carried out in developing nations. Some of these issues include; potential for exploitation of research participants, standard of care debates, quality of informed consent, therapeutic misconception and conflict of interest issues. All of them lead to the violation of very basic ethical principles of autonomy, beneficence, non-maleficence and justice.

Quality of informed consent

The issues regarding the incomplete or inappropriate process of taking informed consent are very commonly identified in the research. Less time is spent to take informed consent and the level of competence and understanding of the participants to fully understand what has been explained to them is very rarely evaluated. Furthermore, less time is spent to understand the cultural practices and norms of the people living in the community where the research is being conducted. This ignorance increases the potential and possibility of exploitation of the study subjects and the probability becomes high when the studies are conducted on the vulnerable groups like the pediatric population or pregnant women. The so-

called "informed consent" does not seem to be informed in most of the cases. Poverty in the population coerces them to agree to participate in the studies when they are offered extravagant amount for participating in research/trials. Additionally, lack of information and availability of health insurance and lack of access of high quality of health care adds to the burden for these people. Furthermore, committing to participate in the research, leads them to face great uncertainties, treatment side effects, paying extra visits to the hospitals/clinics and filling out the forms which seem to be of no use for them. It is also observed that the benefits are highlighted without informing about the associated risks or adverse effects resulting in the violation of right to full information.

Therapeutic misconception

Due to the lack of understanding and low education levels of the people in poorer parts of developing countries, they are more vulnerable to enter in the trials/research with the misunderstanding that they are receiving a treatment. This therapeutic misconception leads to deception of the participants which is unethical. Such studies could be made ethical by ensuring that the participants have completely understood all the components and details of the study in which they consent to participate; no personal medical benefits should be provided to avoid any coercion and that the decision of participation should entirely be voluntary. Taking informed consent from the participants who belong to resource poor areas ensures that the right to autonomy and respect has been duly given.

When the participants are encouraged to participate in research without proper informed consent, they are used as mere means to achieve the end which is not ethically justifiable. In addition to the above points, all the participants participating in research are considered as vulnerable as they are most likely to make coerced decisions to participate. Informed consent plays a very important role as a tool to protect the potentially vulnerable research subjects.

Conflict of interest issues

Physicians and researchers could also have their internal conflict of interests, thus, the dual role of an investigator as a physician is strongly discouraged. These conflict of interest issues also arise when corruption occurs at national and local levels. Furthermore, the review boards sometimes are not independent enough, which allows the unethical research to be carried out in the developing nations. In order to eliminate this issue, the review boards at local and national level should be independent and that they should not have any intrinsic conflict of interest which might endanger the vulnerable research participants and raise the possibility of exploitation. This situation occurs mostly because of the lack of political and economic rights that are entitled to the people living in these countries. Along with that, the

desperate circumstances in which they live intensify the situation.

Thus, when the research/trials are being carried out in less-developed countries, the local situation should primarily be analyzed. Furthermore, the study must aim to address an important problem of the people living in those countries. It is not ethical to carry out such research and clinical studies in the developing nations which would never be available or affordable for the participants or the people living in those parts of the world.

Available guidelines to follow

The guidelines that could be followed to make the clinical research ethical in third world nations include; Nuremberg code, Declaration of Helsinki, Belmont report and other documents that were made in response to certain unethical events. Further, Emanuel, Wendler and Grady, have proposed the ethical guidelines in the form of a framework which could also be followed to make the clinical research ethical in developing countries and could also successfully be applied to the clinical research that are carried out. The main components of the framework include; collaborative partnership, social value, scientific validity, fair selection of study population, independent review, informed consent and respect for study participants. The above given requirements should be followed to make clinical research ethical.

Responsibility of the research enterprise

The research sponsoring country should first collaborate with the host country for the acceptance and the importance of research in their context. It should also be determined that whether the trial is responsive to the community needs. The study should also be assessed for its appropriateness and applicability in the local context in which it is carried out. This includes respect for the values, culture and social practices of the host community.

Evaluation of generation of knowledge

The knowledge that would be generated from the clinical studies should also lead to the improvement in the health of the subjects. Sharing the results of the research should add into the knowledge of the local community resulting in the enhancement of wellbeing. Funding agencies and review committees could compare the relative values of different clinical research and could prioritize the studies that have greater social values as compared to the studies that does not offer much social value. Along with the social value an ethical clinical study should have scientific validity. A research study should be designed in a way that its results should be useful for the health problem the community faces. The study design must be based upon the research objectives and objectives should not be made in isolation. It should be made with including the participants and their problems and objectives should be equally regarded.

Further, the inclusion and exclusion criteria for selecting the subjects should not be biased. The recruitment of the participants should not be merely on the basis of convenience, privilege and vulnerability. Each individual should have equal opportunity to participate or decide to participate in the study unless the researchers have any scientific reason to exclude particular participants from the study. If some subjects are eligible for the study, but their participation could harm them or could put them on the higher risks then these subjects should be excluded from the study. Justice in subject selection in terms of fairness maintains that the individuals or groups who bear the risks of the study should be entitled for getting the benefits as well. No participants should be selected on the basis of economic coercion or political affiliation. However, the vulnerability of the subjects should be identified from before and the reasons for selecting any particular group of people for the research should be because of the high incidence or prevalence rate of disease or any other good reasons.

The issue of allocating risks and benefits to the participants is one of the major ethical issues in the third world context. Research that is funded by developing countries are carried out in third world nations. Clinical studies are done and the participants are left alone after the completion of research bearing the side effects and consequences of the study, which is unethical. In order to eliminate this problem it is important to assess the risks and benefits of the research before they are started or approved. The review committees could play an important role in assessing the planning of these research and the resources they have to provide the benefits to the participants. It should also be the responsibility of the ethics review committees to ensure that these benefits are provided as said and planned. The risks of any study should not in any way over weigh the benefits of the research. In order to make this process more rigorous, it requires that the review boards should be independent. In the context of underdeveloped countries, the review boards might have several conflict of interest factors like; pressure from the researchers or relationships with the government, due to which they might allow some unethical research that does not follow the above guidelines. Thus, there should be transparency and accountability in the review process to prevent the exploitation of the participants.

As the individuals living in these areas usually have very low literacy levels and poor understanding of research and their purpose, they are more vulnerable to being coerced by many ways to participate in research. Sometimes they think that they do not have any other option except for participating in the study or they think that they will have to pay the penalty if they withdraw from the study. This happens because of their lack of knowledge regarding their rights which might be overseen by the investigators. They might also be deceived because of the same reasons and most of the times exploited which would

not be justifiable on ethical grounds. All the elements of informed consent should be properly fulfilled, the rights of the participants to participate in the trials autonomously should be respected, it should be made sure that the participants understand and know that they have a right to withdraw from the study without paying any penalty and most importantly full disclosure of information regarding all the aspects of research that are discussed above should be disclosed in culturally and socially appropriate manner. Moreover, all the information regarding the changes or developments that are made during the course of research should be timely reported and explained to the participants.

Conclusion

Although it is a matter of fact, that the clinical trials and research play a very important role in the scientific and technological development. However, it also gives birth to many ethical problems and dilemmas specially when these research and trials are conducted in developing or resource poor countries. The participants and the community could easily be exploited, coerced, deceived and the vulnerable populations could be posed to greater risks. Certain guidelines could be followed to make the clinical studies ethical in these respective contexts to generate true moral and ethical scientifically sound knowledge.

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