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ABSTRACT

***Background*: Infertility and infertility treatment costs are considered as one of the main challenges that human society increasingly face with.**
***Objective*: To determine infertility treatment costs and out of pocket expenditures imposed on couples referred to infertility treatment center in Yazd, Iran.**
Design: **A descriptive cross sectional study**
Subjects: **A total of 216 couples were selected and contributed in the study through convenient sampling method.**
Setting: **Telephone interviews with couples and medical documents review were also used to ensure the accuracy of collected information.**
Results: **Lost opportunity, direct and indirect costs were 5.562.526, 37.812.354 and 11.125.395 rial respectively (1USD=33,000 rial). Among direct costs the most and the least expenditures belonged to surgery (24.042.137 rial) and clinical visits (174.053 rial). The greatest portion of indirect costs was related to accommodation expenses and the least was due to travel costs (4.898.099 and 2.738.491 rial). Findings confirmed a significant statistical relation between indirect costs and patients' living place, also a significant relation between lost opportunity cost and patients' occupation (P<0.05).**
Conclusion: **Due to the high expenditures related to infertility treatment services also lack of insurance coverage, policy makers should pay a particular attention on meeting the reproductive health needs of a society.**

INTRODUCTION

Infertility is considered as one of the main challenges that human society increasingly face with. According to the World Health Organization's report approximately 80 million couples worldwide have an unresolved problem of infertility with the prevalence percentage differing from 5-30% among different countries (1). On the basis of statistics provided by 12th Iranian Fertility and Infertility Congress, about one hundred thousand young couples are annually added to the number of infertile population in the country. Approximately one-fourth of Iranian couples experience primary infertility during their married life which 3.4% of them, face with such a problem at any point of time (2). Among different infertility cases, 40% are mainly due to male infertility, 40% belongs to female infertility and in 10-15% of cases no cause is found (3).

Today significant progress has been made in the field of infertility treatment so that a great number of infertilities are treatable using different methods of surgery, ovarian stimulating medication or assisted reproductive technology (ART) (4). It is obvious that none of these treatment remedies are free of charge. The average cost of infertility treatment in Europe, United states and even countries in Persian Gulf region is at least 10.000 $ for fertility medication and *In vitro* Fertilisation (IVF) (5). A large number of couples who attempt such treatments have to spend main part of their income and consequently become heavily committed in terms of financial matters (4). However, assessments show that infertility diagnosis and treatment costs in Iran are significantly lower than European and American countries (6). Despite this and due to the growing incidence and prevalence rate of infertility in our country, patients' access to needed services is still a problematic issue. In fact financing difficulties in this part of health system's

services is not only due to lack of insurance coverage but also relates to ambiguity in defining medical tariffs paid for such service (4). According to the experts' opinion, infertility is a relatively important issue in Iran which demands more attention given to patients' needs especially those belonged to lower levels of income who are more likely to suffer from catastrophic payments of infertility treatment(7) .

A constant challenge ahead of healthcare planners and policy makers particularly in developing countries is how to finance reproductive health services (8). Despite all the efforts have been made in this area, still provision of such services in low income countries mainly relies on out of pocket payments lacking prepayment or risk pooling mechanisms(7). In a case that health expenditures precede household income or constitute a greater portion than non medical costs, the risk for imposing catastrophic payments to patients would be doubled (9). In Iran most of the infertility treatment services such as IVF, Zygote Intrafallopian Transfer (ZIFT) and Gamete Intrafallopian Transfer (GIFT) have been excluded from the basic medical insurance coverage since 1995 and supplemental insurers were also reluctant to cover these types of services. Since then no considerable effort has been devoted to resolve financing problems of such an area which consequently led to a great number of infertile population lacking a proper financial coverage and suffering from out of pocket expenses (4). Given the importance of subject and lack of adequate studies done in this area, we conducted a research to determine infertility treatment costs and out of pocket payments imposed on couples referred to infertility treatment center in Yazd, Iran in 2014.

MATERIALS AND METHODS

This was a descriptive cross sectional study conducted in one of the infertility treatment centers of Yazd province in Iran in 2014. Statistical population was consisted of all couples who have received IVF treatment as a reproductive health service in a time period of the study. A total of 216 couples were selected and contributed in the study using a convenient method. To collect data about direct, indirect and lost opportunity costs a questionnaire was developed by a research team through identifying the main cost centers. To do so, a literature review was done and several interviews were conducted with infertile couples and gynecologists. As a result a 17 items questionnaire consisted of two parts was developed. The first section was related to demographic characteristics of under study couples and the second part was composed of questions aiming to determine direct costs (including visiting and consulting costs, laboratory diagnostic tests, surgery and medication), indirect costs (including food, accommodation and traveling costs) and finally lost opportunity costs which encompassed expenditures imposed on patients due to being absent from a workplace. To ensure content validity, the questionnaire was assessed by a team specialized in a field of health care management and health policy making. Reliability checking was also done through distribution of 30 questionnaires among couples and measurement of Chronbach's alpha to assure the internal consistency of questions (0.95).

In a case that participants were familiarised with study objectives and agreed to take part in the research, telephone interviews were made to collect information from study couples using a self constructed questionnaire. Besides conducting the interviews, document review was also done to control probable biases which might exist in patients' oral statements. Descriptive and analytical analyses were done using SPSS 18 software.

RESULTS

The majority of female participants were non indigenous (64.4%) in an age group of 31-40 years old (46.3%) with a BS degree or upper educational levels (40.28%). Most of the study couples were insured (98.6%), mainly under social insurance coverage (57.4%) but lacking any supplemental insurance plans (59.7%). Furthermore 70.4% of female participants were housewives and their husbands had non-governmental occupation (65.75%).

Total direct costs per service unit rendered to study couples was 37.812.354 rial, (1USD=30,000 rial) so that the highest amount of cost was related to surgery services with an average expenditures of 24.042.137 rial and least was due to medical visits with an average of 174.053 rial Table 1.

Table 1
Direct costs of each infertility treatment services' type

Direct Costs	Service Type	Cost per Service (rial*)	Percent (%)
	Medical visit	174.053	0.46
	Consulting	352.523	0.93
	Sonography	1.355.706	3.58
	Laboratory diagnostic test	851.032	2.25
	Surgery	24.042.137	63.58
	Medication	9.936.134	26.28
	Others	1.100.769	2.92
	Total	378.123.54	100

*1 Dollar = 33000 Rial in 2014

Total indirect costs per couple was 12.125.395 rial, so that expenditures related to accommodation constituted the main portion (4.898.099 rial) and traveling the least part of total cost (2.748.491 rial). Finally the average lost opportunity cost per couple was estimated to5.562.526 rial (table 2).

Table 2
Indirect and Lost Opportunity Costs of Infertility Treatment Services per study Couples

Indirect Costs	Service Type	Cost per Service (rial*)	Percent (%)
	Travel	2.738.491	22.58
	Accommodation	4.898.099	40.40
	Food	4.488.805	37.02
	Total	12.125.395	100
Lost Opportunity Costs	Absence from Work Place	5.562.526	100

*1 Dollar = 33000 Rial in 2014

Study results confirmed that proportion of out of pocket payments imposed on study participants was exactly equal to direct costs per services type (table 3).

Table 3
Proportion of Out of Pocket Payments from Total Direct Costs Imposed on Study Couples

Service Type	Direct cost per Service (rial*)	Out of Pocket Payment (rial*)
Medical visit	174.053	174.053
Consulting	352.523	352.523
Sonography	1.355.706	1.355.706
Laboratory diagnostic test	851.032	851.032
Surgery	24.042.137	24.042.137
Medication	9.936.134	9.936.134
Others	1.100.769	1.100.769

*1 Dollar = 33000 Rial in 2014

Study couples declared that they had to pay total direct costs from their pocket to receive medical services and then those under supplemental insurance coverage could receive a portion of costs from supportive financial packages. As shown in table 4, supplemental insurance packages only covered 4.799.482 rial per service type from total direct costs (37.812.354 rial).

Table 4

Portion of Out of Pocket and Supplemental Insurance Payments from Total Direct Costs imposed on Study Couple

Direct Costs/ Payment Type	Cost Per Service (rial*)	Percent (%)
Direct Costs per Service	37.812.354	-
Out of Pocket Payments	33.032.872	87.36
Supplemental Insurance Coverage	4.779.482	12.64

*1 Dollar = 33000 Rial in 2014

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Findings revealed higher average of indirect and lost opportunity costs among non indigenous couples. In fact results obtained Mann-Whitney test showed a significant statistical relation between costs and couples' living place (P<0.05) (table 5).

Table 5

Statistical Relationship between Infertility Treatment Costs and Couples' Living Place

Living Place		Cost Per Service (rial*)	Percent (%)
Indigenous	Mean	1.986.875	3.094.000
	SD	3.468.987	2.730.979
Non Indigenous	Mean	11.502.677	5.768.928
	SD	7.697.932	4.380.657
P value		<0.05	0.011

*1 Dollar = 33000 Rial in 2014

Analytical statistics also confirmed a significant relation between lost opportunity cost and type of couples' occupation (P<0.05) (table 6).

Table 6

Statistical Relation between Infertility Treatment Costs and Type of Occupation among Study Couples

Type of Occupation		Indirect Costs (Rial*)	Lost Opportunity Costs (Rial*)
Governmental	Mean	8.737.989	1.806.250
	SD	6.061.360	513.000
Non Governmental	Mean	10.226.979	5.826.511
	SD	8.827.153	4.343.635
P value		0.378	<0.05

*1 Dollar = 33000 Rial in 2014

DISCUSSION

A steady rise in healthcare costs particularly in relation to diagnosis and treatment has motivated economists, managers, directors and stakeholders of healthcare organizations even physicians and nurses in many countries to seek new ways to limit high levels of expenditures (10). Since infertility treatment services are costly toward patients and institutional providers' viewpoint, our research was arranged to determine infertility treatment costs and out of pocket expenditures imposed on couples referred to infertility treatment center in Yazd, Iran in 2014.

Study findings revealed that out of total direct costs per services, the great portion was related to surgery operations and medication with 24.042.137 and 9.936.134 rial respectively; while the least part was due to medical visits with 174.053 rial. Javadi *et al* in a similar study found that surgery interventions comprised 54.4% of total healthcare costs while this percentage was 26.3% in terms of medical visits and consulting services (11). In a study conducted by Dolberg et al medication and inpatient hospital services consisted the greatest portion of total costs (12). Due to the nature of IVF treatment and the need for surgical interventions and frequent injections of progesterone as well as the use of drugs such as Clomiphene Citrate and Gonal-F, such expenditures seem to be natural. Another reason is the rising costs of medical services which include high expenditures of vast technological facilities putting a considerable pressure on healthcare budgets of almost all societies. The third important cause is linked to the methods of financing, so that in low income countries these costs are mainly compensated through patients' out of pocket payments (13). These findings were confirmed in similar studies which emphasised on detrimental effects of out of pocket payments as a major challenge in every healthcare system (14-15). A study conducted in Iran revealed that more than 50% of health services' costs were compensated through out of pocket payments at the time of receiving services by patients which is almost the same as other developing countries' condition (16-18). After direct payments were done by patients, those covered by supplemental insurance could apply to compensate a portion of their costs. But studies have shown that the share of insurance reimbursement was very low and only those couples who were under level III insurance coverage could be benefited from the package services. Such findings undermined the insurance role to prevent harmful effects of high levels of health expenditures. Despite the fact that in studies done by Yardin *et al*, Jooglekar, Merlis *et al*, Water and Kho *et al* health insurance had a positive significant effect on decreasing health expenditures ($P<0.05$) (19-24). Son et al proposed that insurance plans should be improved through focusing on governmental subsidies for reimbursement purposes or as an alternative solution. They mentioned the need to exclude the poor population from medical expenses (25). In some jurisdictions such as Germany, infertility is considered to be a disease (4). while insurance companies in some other countries including India excluded infertility treatment services from their coverage (26). Evidence shows that private insurers do not have an active participation in a private financing sector of Iran health system. Therefore financing mainly relies on out of pocket and direct participation of households which is a significant contradiction with social justice (27). Such an insurance shortcoming can be obviously seen in relation to infertility treatment services which are often neglected from suitable coverage (4). Given that infertility is one of the main individual and social problems of many couples worldwide requiring high costs for medical treatment also due to the fact that insurance coverage is not very effective for this problem, policy makers and health system managers must pay serious and practical attention to this area. Finally it is not ethically accepted to expand infertility insurance without constant changes in medical expenses. On the other hand it would not be ethical to deprive infertile couples from the right of having children for economic reasons. Therefore challenges associated with infertility treatment services and insurance coverage should continue to be discussed until appropriate solutions change the process of economic issues in a proper manner (28).

Study also revealed that treatment costs in non indigenous patients were higher in compared with the others. Possible explanation for this finding was that such patients had to leave their place of residence to receive healthcare services and consequently would be incurred with heavy indirect costs of traveling or accommodation. This finding was in consistence with other study results and defined living place as an influencing factor on healthcare expenditures (14, 29). Among indirect costs per couple, accommodation with 4.898.099 rial and traveling costs with 2.738.491 rial comprised the most and the least portion of expenditures respectively. Since each couple has to stay on average 10 days in Yazd infertility treatment center for initial treatment until determination of pregnancy outcomes also most of the study participants were non indigenous, it was obvious that they would be faced with high burden of costs. Soofi (2013), Razavi (2005), Mehrara (2009), Yardin (2010), Nal (2011), Ranjbar (2012 also emphasized on the influence of living place as an important factor on healthcare costs in their researches (19, 25, 30-33).

In conclusion, according to study results, the lost opportunity cost has a statistical significant relation with patients' occupation so that the average cost among those who are self employed were far more than those with governmental jobs. To justify this relationship, it can be acknowledged that due to the close dependency of nongovernmental workers' income on the time and daily efforts they spend also the fact that any closure in their business would negatively affect the earnings, they obviously incur with heavier burden of indirect costs than governmental workers.

Regarding study results, greater efforts must be done

to reduce infertility treatment costs, among which bellow issues are suggested for healthcare managers to consider:

- Developing new insurance policies to reduce infertility treatment costs
- Covering all necessary drugs for infertile couples by supplemental and governmental insurance packages
- Provision of drug subsidies by government to resolve infertility complications among couples
- Greater cooperation of supplemental insurers in terms of couples' payment reimbursement
- Provision of preferably free accommodation for couples traveling from long distances

We think that our study has taken a step in this field of research. It is also necessary to note that our study had some limitations. First, this study was cross-sectional and thus the generalisation of its findings should be done with caution. Also, the analysed data of this study, all were self-reported. So the limitations of self-reported data should be kept in mind.

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