



AN EMPIRICAL ANALYSIS ON AYURVEDA AS SUSTAINABLE HEALTH CARE SYSTEM OF MEDICINE

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ABSTRACT

The present paper comparatively analyses conventional system of medicine i.e. Allopathy and Ayurveda system of medicine in terms of Medical Expenditure on certain common ailments (Diabetes, Obesity, Migraine, Respiratory disorders-Sinusitis, Rhinitis, Asthma, Musculoskeletal disorders- Arthritis, Spondylosis, Urinary disorders-Calculi, Gastrointestinal-Gastritis, Neurological-Paralysis, Gynecological- Menstrual disorders, Dermatological conditions-Psoriasis, Eczema) at Out Patient Department (OPD) and In Patient Department (IPD), Side effects and Expenditure on them and, Expenditure on earlier treatments. The sustainable dimensions were analyzed through cost effectiveness, results, side effects, duration of illness and net benefits. Various statistical and econometric techniques like Chi-square test, One way Anova, Multiple ways Anova (Two way Anova and Three way Anova), Ordinal Logistic Regression and Discriminant Analysis were employed to analyze the data collected from 400 respondents. The result clearly gave an edge to Ayurveda system of healthcare in all the sustainable dimensions of health care that were considered for the study.

KEYWORDS: Sustainable Healthcare, Ayurveda, Allopathy, Healthcare Costs, Cost Effectiveness, Side Effects, Net Benefits

Article History

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INTRODUCTION

Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (World Health Organization (2003)¹). Health has been the preoccupation of man in all ages and has been the focus of research ever since the humankind realized that health is the most precious thing and is the first and foremost asset in itself. Life and health is precious for everyone irrespective of rich or poor.

Health care costs are rising across the globe and burdening people due to increased spending on health care. Every time an individual gets sick, he/she is worried about two aspects, one is sickness and the other is the medical expenditure. Most of the times people neglect their health to gain wealth, and then loose wealth to regain health. By ethical sense, health is a priceless commodity but by economic sense health care appears to be expensive. If health care costs increase at present

¹ World Health Organization. (2003). WHO definition of Health. Retrieved from <http://www.who.int/about/definition/en/print.html>

rate, then health might be a good that could not be affordable by most people (Breyer, Zweifel, & Kifmann, 1997)².

Many studies suggest an increasing disease burden and the current life style being the reason behind the startling situation. There is slow but certain realization that the conventional health care on which the majority of the population is depending since many decades cannot alone reverse the situation. Hence there is surge of interest towards alternative systems of health care that promotes health and wellness.

There is increasing interest in approaches that build Health and Wellbeing in a more sustainable way. Even in western countries there is surge of interest towards alternative systems of medicine or holistic health care approaches such as Ayurveda, Yoga, Spirituality-Meditation, Naturopathy, Herbal medicine etc, Hence the emphasis on integration of holistic healthcare approaches to control the situation is being seriously considered. A more sustainable health care will offer people the choices and the ability to take charge of their own health.

SCOPE

This study quantifies the economic and business costs of selected chronic diseases when managed through Ayurveda and Conventional system of medicine (Allopathy). It estimates current costs in some most common medical conditions (musculoskeletal disorders, neurological conditions, gastro intestinal disorders, respiratory disorders, migraine, sinusitis, diabetes, obesity, dermatological disorders and gynecological disorders) when managed through Ayurveda and Allopathy health care.

The sustainability factors of health care system can be looked at in terms of disease preventive aspects, health promoting aspects, curative aspects, cost effectiveness, absence of side effects, duration of healing, natural or bio friendly, being holistic etc. When health is affected, people seek different health systems. This behavior of preferring different healthcare systems is influenced by factors like duration of treatment, treatment results, expenditure etc. Hence it is important for health care systems to offer people the best and salubrious options to march towards the realization of 'health for all' and a life with optimum health expectancy.

OBJECTIVES OF THE STUDY

The Present Study has the Following Objectives

- Highlight the role and importance of Ayurveda from sustainable perspective.
- Comparatively analyze expenditure, treatment results, duration of illness, earlier choice of health care and treatments, side effects and expenditure on side effects for Ayurveda and Allopathy.
- Analyze the cost effectiveness of Ayurveda and conventional health care (Allopathy).
- To identify the factors determining the difference in Ayurveda and Allopathy health care.

HYPOTHESES FOR THE STUDY

The Hypotheses Specified are as Follows

- There is difference in expenditure and treatment results for Ayurveda and Allopathy.

² Breyer, F., Zweifel, P., & Kifmann, M. (1997). Health economics. Berlin/Heidelberg, 22009.

- Existence of positive external economies (holistic, natural, no side effects, cost effectiveness, preventive aspects) makes Ayurveda health care sustainable compared to Allopathy health care.

METHODOLOGY AND DATA SOURCES FOR THE STUDY

Primary data

Primary data was collected from patients and healthcare professionals of selected healthcare centers of Ayurveda and Allopathy. The data has been collected through structured questionnaires, direct interview of clients and patients from OPD and IPD of reputed Ayurveda and Allopathy hospitals of Mysuru, Karnataka State and Ernakulam, Kerala State.

Sampling

The convenient and random sampling techniques were used for the study. The sample size was 400, equally distributed between two states and two systems of medicine.

Study Area

Kerala state is known to be the hub of Ayurveda. The practice of Ayurveda is followed since generations in some families. The popularity of Ayurveda overseas is reflected in the huge numbers of foreign medical tourists visiting Kerala. Due to the extensive prevalence and intensive practice of Ayurveda, Kerala is selected for the study. In comparison to Kerala, Karnataka is considered as moderate state in terms of prevalence and practice of Ayurveda.

METHODOLOGY

The data collected is systematically presented in the form of tables and represented graphically. Independent samples 't' test, Chi-square test of independence, One way, Two way and Three way Anova, Ordinal logistic regression, estimation of Net benefits, and Discriminant analysis have been employed for testing various hypotheses. Descriptive statistics were used to represent frequency and percentage analysis.

Variables for the Study

Following variables were considered for the study

Factors Relating to Health System: Choice of health system, Preference of health system, Type of illness, Existence of side effects and perception on factors relating to health systems i.e., whether the health system is holistic, natural, has side effects, quick/ slow in relief, gives temporary/ permanent relief, accessibility, cost effective and scientific/ unscientific.

Factors Relating to Duration: Duration of illness and duration of treatment in present choice and previous choice of health care.

Factors Relating to Treatment Results: Treatment results in present choice and previous choice of health care.

Expenditure Factors: Expenditure on given illness in present choice of health care, Expenditure on given illness in previous choice of health care and Expenditure on side effects.

DISCUSSIONS

Sustainable Perspectives of Ayurveda

Any medications in modern medicine most of the times comes with a package of side effects to either any organ or a system which is away from sustainability. The commonly used antibiotics, analgesics, anti-inflammatory agents or cardiovascular drugs

or chemotherapy agents may have adverse reactions or side effects that may sometimes be simple such as nausea, vomiting, dermatitis, abdominal pain etc, or that may be severe effects such as shock, stroke, impact on heart, kidneys' health or may bring fetal abnormalities, or may induce diabetes, peptic ulcers, hypertension, depression etc and may even be fatal.

All means and measures of health care that meet human, social, economic and environmental pillars of sustainability can only be called as salubrious or sustainable health care. In this regard, Ayurveda medicines with contents such as ginger, turmeric, cumin, cinnamon, pepper, Indian gooseberry, holy basil or any other herbs that possess natural analgesic, anti-inflammatory, anti-microbial, anti-parasitic, hypoglycemic, anti-diabetic, anti-cancerous, adaptogenic, immunomodulatory, anti-oxidant activities are bio-friendly and compatible with less or no side effects. Ayurveda system of healthcare involving methods of health management such as massages and panchakarma therapies are part of healthy life style, rejuvenating and detox therapies that are health promoting, preventive and curative in its approaches which falls under the umbrella of sustainable parameters.

Expenditure

Information on expenditure incurred on treatments of various conditions and under different health systems is very important in estimating cost effectiveness and net benefits. The respondents were asked to indicate costs incurred on treatments of illnesses. Presuming that the expenditure pattern might be different for Ayurveda and Allopathy, the differences were examined with the help of mean expenditures, One way Anova and independent samples 't' test. The null and alternate hypotheses are specified as follows:

- H_0 : There is no difference in the expenditures incurred on illness in Ayurveda and Allopathy treatments.
- H_A : There is difference in the expenditures incurred on illness in Ayurveda and Allopathy treatments.

The data on mean expenditure on treatments in Ayurveda and Allopathy are indicated in Table 1. The mean expenditure in Ayurveda is Rs. 10,940 which is much lower than mean expenditure in Allopathy which is Rs. 27,251. The F statistic of 38.551 in Table 1.2 and 't' statistic in table 1.3 which is highly significant lead to the acceptance of H_A that there is difference in the expenditures incurred on illness in Ayurveda and Allopathy treatments.

Table 4 provides information on mean expenditures for different medical conditions under Ayurveda and Allopathy health systems. The average expenditures on treatment for various conditions under Ayurveda in Karnataka are lesser than Kerala except for Migraine/Sinusitis, Rhinitis/Asthma and Neurological conditions. The difference was found to be highest in the case of musculoskeletal conditions and lowest in case of gastrointestinal conditions.

To know the difference in the cost of treatment, the mean expenditures or costs on various conditions under Ayurveda and Allopathy were analysed both at IPD and OPD. IPD is In Patient Department where a person is admitted in health care institution for receiving treatments. OPD stands for Out Patient Department which does not require admission.

Table 5 and Figure 2 provide information on mean/average IPD expenditures incurred by Ayurveda and Allopathy respondents.

Table 5 shows in case of IPD treatments, the average expenditures on different conditions were highest in case of Allopathy. The differences were large in the cases of musculoskeletal, diabetes and neurological conditions, whereas it was

lowest in the dermatological conditions. Only the expenditures towards the management of obesity was higher in Ayurveda as there were less respondents treated at IPD in Allopathy.

Table 1: Data on Mean Expenditure on Treatments

| | AyAl | N | Mean | Std. Deviation | Std. Error Mean |
|-------------|-----------|-----|------------|----------------|-----------------|
| Expenditure | Ayurveda | 200 | 10490.8500 | 12508.63234 | 884.49387 |
| | Allopathy | 200 | 27251.5350 | 36068.18426 | 2550.40577 |

Source: SPSS Output

Table 2: One Way Anova Results for Expenditure on Treatments

| Expenditure | Anova | | | | | Sig. |
|----------------|-----------------|------------|-------------|--------|--|------|
| | Sum of Squares | df | Mean Square | F | | |
| Between Groups | 2.809E10 | 1 | 2.809E10 | 38.551 | | .000 |
| Within Groups | 2.900E11 | 398 | 7.287E8 | | | |
| Total | 3.181E11 | 399 | | | | |

Source: SPSS Output

Table 3: Independent Samples ‘t’ test for Expenditure on Treatments

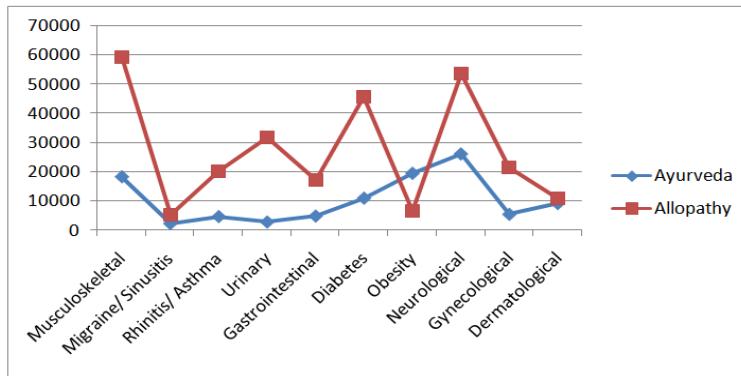
| | Levene's Test for Equality of Variances | t-test for Equality of Means | | | | | | |
|-------------|---|------------------------------|------|--------|---------|-----------------|-----------------|-----------------------|
| | | F | Sig. | t | df | Sig. (2-Tailed) | Mean Difference | Std. Error Difference |
| Expenditure | Equal variances assumed | 53.692 | .000 | -6.209 | 398 | .000 | -16760.68500 | 2699.42568 |
| | Equal variances not assumed | | | -6.209 | 246.186 | .000 | -16760.68500 | 2699.42568 |

Source: SPSS Output

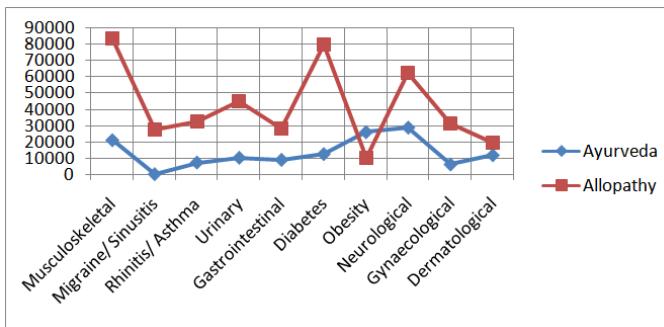
Table 4: Mean Expenditures

| SI No. | Medical Conditions | Mean Expenditure | |
|--------------|---------------------|------------------|-----------------|
| | | Ayurveda | Allopathy |
| 1 | Musculoskeletal | 18389.50 | 59257.85 |
| 2 | Migraine/ Sinusitis | 2355.00 | 5380.00 |
| 3 | Rhinitis/ Asthma | 4760.80 | 20175.00 |
| 4 | Urinary | 2897.50 | 31975.00 |
| 5 | Gastrointestinal | 4921.10 | 17125.00 |
| 6 | Diabetes | 11062.75 | 45650.00 |
| 7 | Obesity | 19578.35 | 6810.00 |
| 8 | Neurological | 26196.85 | 53600.00 |
| 9 | Gynecological | 5525.30 | 21460.00 |
| 10 | Dermatological | 9221.35 | 11082.50 |
| Total | | 10490.85 | 27251.53 |

Source: Estimated from Primary data

**Figure 1: Mean Expenditure.****Source:** Primary Data**Table 5: Mean IPD Expenditures**

| Sl No. | Medical Conditions | IPD | |
|--------------|---------------------|-----------------|-----------------|
| | | Ayurveda | Allopathy |
| 1 | Musculoskeletal | 20702.50 | 83679.75 |
| 2 | Migraine/ Sinusitis | No cases | 27500.00 |
| 3 | Rhinitis/ Asthma | 7089.50 | 32666.67 |
| 4 | Urinary | 10000.00 | 45000.00 |
| 5 | Gastrointestinal | 8731.71 | 28000.00 |
| 6 | Diabetes | 12265.50 | 80000.00 |
| 7 | Obesity | 25625.583 | 10000.to00 |
| 8 | Neurological | 28402.31 | 62625.00 |
| 9 | Gynecological | 5900.85 | 31000.00 |
| 10 | Dermatological | 11566.70 | 19500.00 |
| Total | | 17248.85 | 49930.61 |

Source: Estimated from Primary Data**Figure 2: Mean IPD Expenditure - Ayurveda and Allopathy****Source:** Primary Data

OPD: Ayurveda and Allopathy

The average expenditures in Ayurveda and Allopathy treatments at OPD also present picture similar to IPD expenditures.

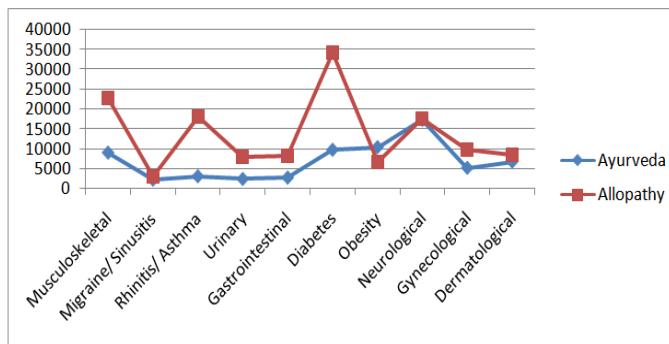
The mean expenditures in Allopathy at OPD were higher for all conditions except for obesity. The difference was highest in the case of diabetes and lowest for migraine/ sinusitis, neurological and dermatological conditions.

Table 6 and Figure 3 provide information on mean/average IPD expenditures incurred by Ayurveda and Allopathy respondents.

Table 6: Mean / Average OPD Expenditures

| | Medical Conditions | OPD | |
|--------------|---------------------|----------------|-----------------|
| | | Ayurveda | Allopathy |
| 1 | Musculoskeletal | 9137.500 | 22625.00 |
| 2 | Migraine/ Sinusitis | 2355.00 | 2922.22 |
| 3 | Rhinitis/ Asthma | 3208.33 | 17970.58 |
| 4 | Urinary | 2523.68 | 7785.71 |
| 5 | Gastrointestinal | 2869.23 | 8227.27 |
| 6 | Diabetes | 9860.00 | 34200.00 |
| 7 | Obesity | 10507.50 | 6642.10 |
| 8 | Neurological | 17375.00 | 17500.00 |
| 9 | Gynecological | 5323.07 | 9800.00 |
| 10 | Dermatological | 6876.00 | 8276.66 |
| Total | | 5287.78 | 13054.06 |

Source: Estimated from Primary Data

**Figure 3: Mean OPD Expenditure - Ayurveda and Allopathy.**

Source: Primary Data

One Way Anova Was Used to Test the Following Hypotheses:

- H_{01} : There is no difference in IPD treatment costs of the Ayurveda and Allopathy
- H_{A1} : There is difference in IPD treatment costs of the Ayurveda and Allopathy
- H_{01} : There is no difference in OPD treatment costs of the Ayurveda and Allopathy
- H_{A1} : There is difference in OPD treatment costs of the Ayurveda and Allopathy

The highly significant F statistics in Tables 7 and 8 indicate that there is difference in treatment costs incurred by Ayurveda and Allopathy respondents both at IPD and OPD with mean expenditures in Ayurveda being lesser than that of Allopathy.

Table 7: Anova Results for IPD Expenditures

| Expenditure | | | | | |
|----------------|-----------------|------------|-------------|--------|------|
| | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 4.363E10 | 1 | 4.363E10 | 39.258 | .000 |
| Within Groups | 1.800E11 | 162 | 1.111E9 | | |
| Total | 2.237E11 | 163 | | | |

Source: SPSS output

Table 8: Anova Results for OPD Expenditures

| Expenditure | | | | | |
|--------------------|-----------------|------------|-------------|--------|------|
| | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 3.552E9 | 1 | 3.552E9 | 21.562 | .000 |
| Within Groups | 3.855E10 | 234 | 1.647E8 | | |
| Total | 4.210E10 | 235 | | | |

Source: SPSS output

Duration of Illness

The data on duration of illness for treatment received by Ayurveda and Allopathy respondents were collected. The information was later grouped into following categories of 0-1 month, 1-6 months, 6 months – 1 year, 1 year -5 years, 5- 10 years and above 10 years. Table 9 provides information on duration of illness under Ayurveda and Allopathy system.

Duration of illness was significantly different for Ayurveda and Allopathy respondents. Most of the respondents with chronic conditions (greater than 1 year of illness) are under the Ayurveda health care i.e. 52.5 percent where as in Allopathy it was 46 percent. The respondents with 5-10 years and above 10 years' duration of illness in Ayurveda were 26.5 percent and where as in Allopathy it was only 17 percent.

The chi square test of independence was used to test the relationship between duration of illness and system of health care. The results are given in Table 10.

The chi square statistic 12.091 was significant at 5 percent indicating relation between duration of illness and choice of health care.

Table 9: Duration of Illness

| | | Duration of Illness | | | | | | Total |
|-----------|----------|---------------------|-------------------|-------------------------|------------------------|-------------------|-----------------------|--------------|
| | | 0-1 Month | 1-6 Months | 6 Months- 1 Year | 1 Year- 5 Years | 5-10 Years | Above 10 Years | |
| Ayurveda | Count | 15 | 47 | 33 | 52 | 27 | 26 | 200 |
| | % within | 7.5 % | 23.5 % | 16.5 % | 26.0 % | 13.5 % | 13.0 % | 100.0 % |
| Allopathy | Count | 20 | 35 | 53 | 58 | 20 | 14 | 200 |
| | % within | 10.0 % | 17.5 % | 26.5 % | 29.0 % | 10.0 % | 7.0 % | 100.0 % |

Source: SPSS Output

Table 10: Duration of Illness Vs Health System

| Chi-Square Test Result | | | |
|------------------------------|---------------------|-----------|------------------------------|
| | Value | df | Asymp. Sig. (2-sided) |
| Pearson Chi-Square | 12.091 ^a | 5 | .034 |
| Likelihood Ratio | 12.203 | 5 | .032 |
| Linear-by-Linear Association | 2.183 | 1 | .140 |
| N of Valid Cases | 400 | | |

Source: SPSS Output

Duration of Treatment and Expenditure

The duration of treatment is an important part which influences the expenditure on treatments. Both the variables in turn are impacted by the choice of health care. The duration of treatment variable was classified as 1-7 days, 8-15 days, 16-25 days and 26 days and above. The information in Table 11 clearly indicates that the mean expenditures under Allopathy are higher than that of Ayurveda for all duration of treatments.

One way Anova test was employed to test the differences in duration of treatment and expenditures under Ayurveda and Allopathy. The results in Table 12 show that the F statistic is highly significant leading to the acceptance of differences in both the variables for Ayurveda and Allopathy.

Two way Anova was employed to identify the influence of choice of health care and duration of treatment on expenditure. The results are given in Table 13. The duration of treatment and choice of health care significantly influence expenditure on treatments. The mean expenditure in Ayurveda for all duration of treatment was lesser than Allopathy. The mean expenditure on Ayurveda was Rs. 10,779.04 whereas for Allopathy it was Rs. 28,282.28. The results indicate that expenditure is statistically influenced by duration of treatment and choice of health care.

Table 11: Duration of Treatment and Mean Expenditure

| Expenditure | | | | |
|-----------------------|-----------|------------|----------------|-----|
| Duration of Treatment | AyAl | Mean | Std. Deviation | N |
| 1-7 days | Ayurveda | 8597.4375 | 6852.13942 | 32 |
| | Allopathy | 22561.2143 | 16120.39126 | 14 |
| 8-15 days | Ayurveda | 14758.8000 | 13380.44391 | 40 |
| | Allopathy | 45064.0000 | 51697.63760 | 25 |
| 16-25 days | Ayurveda | 10363.8710 | 11467.02300 | 31 |
| | Allopathy | 19902.5000 | 25679.77125 | 20 |
| 26 days & above | Ayurveda | 9396.0825 | 13614.45271 | 97 |
| | Allopathy | 25601.4184 | 34756.94789 | 141 |

Source: Estimated from Primary Data

Table 12: Anova Results for Duration of Treatment and Expenditure in Ayurveda and Allopathy

| | | Sum of Squares | df | Mean Square | F | Sig. |
|-----------------------|----------------|-------------------------|------------|-----------------|--------|------|
| Duration of treatment | Between Groups | 22.563 | 1 | 22.563 | 20.043 | .000 |
| | Within Groups | 448.035 | 398 | 1.126 | | |
| | Total | 470.597 | 399 | | | |
| Expenditure | Between Groups | 28092056166.922 | 1 | 28092056166.922 | 38.551 | .000 |
| | Within Groups | 290018579889.255 | 398 | 728689899.219 | | |
| | Total | 318110636056.178 | 399 | | | |

Source: SPSS Output

Table 13: Anova Results for Expenditure with Duration of Treatment and System of Health Care

| Dependent Variable: Expenditure | | | | | |
|---------------------------------|-------------------------|------------|-----------------|---------|------|
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
| Corrected Model | 38756326581.410 | 7 | 5536618083.059 | 7.769 | .000 |
| Intercept | 91317324362.138 | 1 | 91317324362.138 | 128.140 | .000 |
| Duration of treatment | 9027597918.241 | 3 | 3009199306.080 | 4.223 | .006 |
| Ayurveda/Allopathy | 18335627361.273 | 1 | 18335627361.273 | 25.729 | .000 |
| Duration of treatment * Ay/Al | 3510532070.292 | 3 | 1170177356.764 | 1.642 | .179 |
| Error | 279354309474.768 | 392 | 712638544.578 | | |
| Total | 460559398605.000 | 400 | | | |
| Corrected Total | 318110636056.178 | 399 | | | |

a. R Squared = .122 (Adjusted R Squared = .106)

Source: SPSS Output

Note: Ay/Al is Ayurveda and Allopathy Health System

Earlier Treatment

Earlier Treatment Results

The earlier treatments result and expenditure on the same provide an important source of information on the respondent's present choice of health system. When the respondents were not completely satisfied with earlier treatment, there will be a change in the choice of health system. Hence the information on earlier treatment results with the present choice of health system was collected. Table 14 provides information on earlier treatment results of respondents.

Table 14 shows Out of 400 respondent's 90 respondents had received treatment earlier under a health system different from the current/present choice. For example, the current Ayurveda respondent has received treatment under Allopathy earlier. Among 90 respondents 85 i.e. 94.45 percent had received treatments under Allopathy. 4 respondents i.e. 4.4 percent under Ayurveda care and only one respondent was under other system. The 85 respondents who were under Allopathy health care have indicated results as follows:

- 51 i.e. 60 percent - average;
- 32 i.e. 37.65 percent - good;
- 1 respondent- better and;
- 1 - Not satisfactory.

Table 14: Earlier Treatment Results

| | | Earlier Treatment Results | | | | Total |
|--------------|----------|---------------------------|---------------|------------|--------------|-----------|
| | | Not Satisfactory | Average (1-3) | Good (4-6) | Better (7-9) | |
| Ayurveda | 0 | 0 | 4 | 0 | 0 | 4 |
| Allopathy | 1 | 51 | 32 | 1 | 0 | 85 |
| Other | 0 | 0 | 1 | 0 | 0 | 1 |
| Total | 1 | 51 | 37 | 1 | 0 | 90 |

Source: Cross Tabulation from SPSS

Expenditure on Earlier Treatment

The information relating to expenditure on earlier treatment along with results helps in understanding the shifts in respondent's choice of health system. 63 respondents (70 percent) have spent less than Rs. 30000; 27 respondents (30 percent) above Rs. 30000. The information on the same is given in Table 15.

Three way Anova was used to identify the influence of earlier treatment, its results and expenditure on present choice of health system. The results provided in Table 16 indicate that both earlier treatment results and expenditure were highly significant in respondents' present choice of health system. Further it was hypothesized that the respondents present choice of health system was influenced by choice of earlier health system (either by first preference or tried other system before or were referred by others) and earlier treatment results. Hence Two way Anova was used to identify the impact of the same.

The results in Table 17 indicate that there was significant impact of respondent's preference (first or tried other system or were referred by others), and earlier treatment results on present choice of health system (Ayurveda/Allopathy). The interaction between the preference and earlier treatment results was the interesting aspect that was observed. Even the interaction effect has significant bearing on the current choice of health system of the respondents. The interaction effect

was significant at 5 percent level and others at 1 percent.

Table 15: Expenditure on Earlier Treatment

| | | Earlier Treatment Expenditure | | | | | | Total |
|--------------------|-----------|-------------------------------|-------------|-------------|-------------|-------------|-----------------|-----------|
| | | Less than 10000 | 10001-20000 | 20001-30000 | 30001-40000 | 40001-50000 | 50001 and above | |
| System of Medicine | Ayurveda | 3 | 0 | 0 | 0 | 1 | 0 | 4 |
| | Allopathy | 25 | 18 | 16 | 5 | 6 | 15 | 84 |
| | Other | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Total | | 29 | 18 | 16 | 5 | 7 | 15 | 89 |

Source: Cross Tabulation from SPSS

Table 16: Present Choice of Health System and Earlier Treatment Variables (System of Medicine, Results, Expenditure)

| Tests of Between-Subjects Effects | | | | | |
|---|-------------------------|-----------|-------------|---------|------|
| Dependent Variable: Ay/AI | | | | | |
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
| Corrected Model | 7.222 ^a | 40 | .181 | 5.308 | .000 |
| Intercept | 31.062 | 1 | 31.062 | 913.226 | .000 |
| ETResult | .678 | 3 | .226 | 6.642 | .001 |
| EarlierTreatment (System of medicine) | .750 | 1 | .750 | 22.050 | .000 |
| ETExpenditure | 1.650 | 24 | .069 | 2.021 | .019 |
| ETResult * EarlierTreatment | .000 | 0 | . | . | . |
| ETResult * ETExpenditure | .321 | 9 | .036 | 1.048 | .417 |
| EarlierTreatment * ETExpenditure | .000 | 0 | . | . | . |
| ETResult * EarlierTreatment * ETExpenditure | .000 | 0 | . | . | . |
| Error | 1.667 | 49 | .034 | | |
| Total | 120.000 | 90 | | | |
| Corrected Total | 8.889 | 89 | | | |

a. R Squared =.813 (Adjusted R Squared =.659)

Source: SPSS Output

Table 17: Anova Results for Influence of Choice of Health System and Earlier Treatment Results on Current Health System

| Dependent Variable: AyAI | | | | | |
|--------------------------|-------------------------|-----------|-------------|---------|------|
| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
| Corrected Model | 4.079 ^a | 7 | .583 | 9.936 | .000 |
| Intercept | 23.285 | 1 | 23.285 | 396.992 | .000 |
| Choice of MS | 2.520 | 2 | 1.260 | 21.483 | .000 |
| ET Result | 1.097 | 3 | .366 | 6.234 | .001 |
| Choice of MS * ET Result | .406 | 2 | .203 | 3.463 | .036 |
| Error | 4.810 | 82 | .059 | | |
| Total | 120.000 | 90 | | | |
| Corrected Total | 8.889 | 89 | | | |

a. R Squared =.459 (Adjusted R Squared =.413)

Source: SPSS Output

Side Effects

When people receive treatments for medical conditions, sometimes unwanted and harmful effects are observed which are known as side effects. In the study sample of 400 respondents 26 have experienced side effects and all of them were from Allopathy. None of the Ayurveda respondents have faced the problem of side effects of treatments.

Table 18 and Figure 4 provide information on side effects and expenditure incurred on the same.

Figure 4 shows among the respondents who experienced side effects due to treatment had to spend further for the management of the side effects and the cost varied from Rs.1000 to Rs. 125000. The side effects also varied from minor effects like vomiting, gastritis, skin allergy, urticaria, depression to major effects like loss of function in the lower limbs followed by an operation.

Table 18: Side Effects and Expenditure

| | | Frequency | Percent |
|-----------|--------------|------------|--------------|
| Ayurveda | System | 200 | 100.0 |
| Allopathy | 1000.00 | 3 | 1.5 |
| | 1500.00 | 1 | .5 |
| | 2000.00 | 7 | 3.5 |
| | 2500.00 | 1 | .5 |
| | 3000.00 | 1 | .5 |
| | 5000.00 | 3 | 1.5 |
| | 10000.00 | 4 | 2.0 |
| | 20000.00 | 1 | .5 |
| | 25000.00 | 1 | .5 |
| | 50000.00 | 1 | .5 |
| | 60000.00 | 1 | .5 |
| | 100000.00 | 1 | .5 |
| | 125000.00 | 1 | .5 |
| | Total | 26 | 13.0 |
| | System | 174 | 87.0 |
| | Total | 200 | 100.0 |

Source: SPSS output

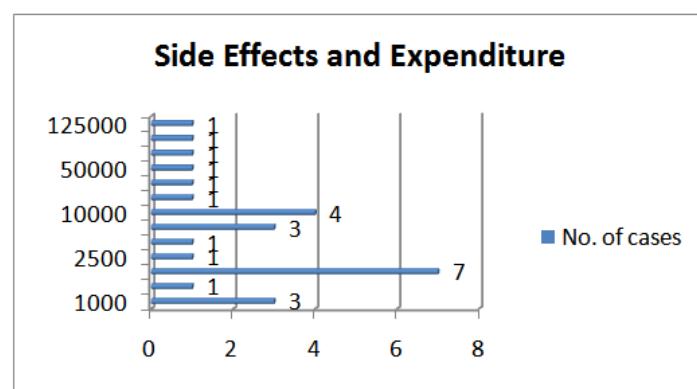


Figure 4: Expenditure on Side effects

Source: Table 18

RESULTS

The results of treatments provide key indication on whether the health care chosen was effective or not. The respondents were asked to rate the results on a scale of 0-10. The results were then grouped as follows:

- 0 - Not Satisfactory;
- 1-3 - Average;
- 4-6 - Good;
- 7-9 - Better and;
- 10 - Best.

The association between treatment results and the health system is analysed with the help of chi square test of independence.

The null hypothesis for χ^2 test is specified as

- H_0 : Treatment results are independent of chosen health system

The results provided in Table 19 clearly indicate that there is significant statistical relationship between results and the chosen system of medicine rejecting the H_0 .

Following Table 20 provides information on Treatment Results for Ayurveda and Allopathy respondents.

Table 20 shows 68 % of the Ayurveda respondents indicate that the results were better, 28% as best. Only 0.5% (1 respondent) has indicated results as average. 3.5% (7 respondents) rated it as good. In case of Allopathy 50% rated results as good, 33.5 % as better and 4.5% rated results as best and 2.5% (5 respondents) as not satisfactory.

The mean scores of treatment results are provided in Table 21.

Table 21 shows the treatment results vary as per the health system chosen. The mean score for treatment results for Ayurveda was 3.235 higher than that for Allopathy which was 2.280 indicating significant difference between treatment results and chosen health system.

Table 19: Treatment Results and Health System

| Statistic | | χ^2 |
|--------------|--|----------|
| Value | | 159.470 |
| Significance | | 0.000 |

Source: From SPSS Output Table

Table 20: Treatment Results Vs Health System

| | | Result | | | | | Total |
|-----------|----------|------------------|---------------|------------|--------------|-----------|---------|
| | | Not Satisfactory | Average (1-3) | Good (4-6) | Better (7-9) | Best (10) | |
| Ayurveda | Count | 0 | 1 | 7 | 136 | 56 | 200 |
| | % within | 0.0 % | 0.5 % | 3.5 % | 68.0 % | 28.0 % | 100.0 % |
| Allopathy | Count | 5 | 19 | 100 | 67 | 9 | 200 |
| | % within | 2.5 % | 9.5 % | 50.0 % | 33.5 % | 4.5 % | 100.0 % |

Source: SPSS Output

Table 21: Mean Scores for Treatment Results

| | Health Systems | N | Mean |
|-------------------|----------------|-----|--------|
| Treatment Results | Ayurveda | 200 | 3.2350 |
| | Allopathy | 200 | 2.2800 |

Source: Compiled from SPSS Output Tables

Ordinal Logistic Regression for Treatment Results

The ordinal logistic regression was used to identify the factors influencing the differences in the treatment results. The variables considered were whether the treatment was under Ayurveda or Allopathy system of medicine, duration of illness, duration of treatment and presence or absence of side effects. The results of ordinal logistic regression are given below:

The chi square statistic significant at 1 percent level shows that the ordinal logistic model is a good fit.

Table 23 shows except for the duration of treatment other three variables were found to significantly explain the differences in treatment results. The estimate value of -1.770 indicate that a unit increase in the variable Ayurveda or Allopathy (i.e. when respondent move from Ayurveda to Allopathy), 1.77 decrease can be expected in the ordered log odds of treatment results. The estimate of side effects i.e. -0.677 suggests that moving from absence to presence of side effects there is a decline in results perception by 0.67. Similarly, as the duration of illness increases the results decline by 0.11.

Table 22: Model Fitting Information

| Model | -2 Log Likelihood | Chi-Square | df | Sig. |
|-------------------------------|-------------------|------------|----|------|
| Intercept Only | 514.790 | | | |
| Final | 299.392 | 215.397 | 8 | .000 |
| Goodness-of-Fit | 274.997 | 188.000 | | |
| Link Function: Probit. | | | | |

Source: SPSS Output

Table 23: Parameter Estimates of Ordinal Logistic Model

| | | Estimate | Std. Error | Wald | df | Sig. | 95% Confidence Interval | |
|-------------------------------|-----------------------|----------|------------|--------|----|------|-------------------------|-------------|
| | | | | | | | Lower Bound | Upper Bound |
| Threshold | [Result =.00] | -5.795 | 1.753 | 10.925 | 1 | .001 | -9.232 | -2.359 |
| | [Result = 1.00] | -4.920 | 1.458 | 11.386 | 1 | .001 | -7.778 | -2.062 |
| | [Result = 2.00] | -3.334 | .926 | 12.963 | 1 | .000 | -5.149 | -1.519 |
| | [Result = 3.00] | -1.503 | .485 | 9.613 | 1 | .002 | -2.453 | -.553 |
| Location | AyAl | -1.770 | .513 | 11.916 | 1 | .001 | -2.775 | -.765 |
| | Side Effects | -.677 | .329 | 4.237 | 1 | .040 | -1.322 | -.032 |
| | Duration of Illness | -.117 | .048 | 5.914 | 1 | .015 | -.211 | -.023 |
| | Duration of treatment | .089 | .062 | 2.091 | 1 | .148 | -.032 | .210 |
| Scale | AyAl | .393 | .150 | 6.884 | 1 | .009 | .099 | .687 |
| | Side Effects | .051 | .188 | .072 | 1 | .788 | -.319 | .420 |
| | Duration of Illness | -.073 | .037 | 4.012 | 1 | .045 | -.145 | -.002 |
| | Duration of treatment | -.134 | .049 | 7.609 | 1 | .006 | -.230 | -.039 |
| Link Function: Probit. | | | | | | | | |
| Cox and Snell | | | | .416 | | | | |
| Nagelkerke | | | | .458 | | | | |
| McFadden | | | | .225 | | | | |

Source: SPSS Output

Net Benefit

Net benefit was estimated for each case by subtracting from the treatment results the expenditure incurred on treatment, earlier treatment and side effects from the results. All the expenditure variables were converted to a scale of 1-5 with 1 for lower levels and 5 for higher levels of expenditure.

The results were rated on the scale of 1 to 10 which was further grouped as Not satisfactory (0), Average (1-3), Good (4-6), Better (7-9) and Best (10).

Net benefit: Result – Expenditure- Earlier Treatment Expenditure- Expenditure on side effects

The estimated net benefits for Ayurveda and Allopathy respondents are given in Table 24. The lowest benefit was -1.00 in case Ayurveda whereas for Allopathy it was -5.00. In case of Ayurveda respondents 75.5 percent had positive net benefit ranging from 1 to 3, whereas for Allopathy respondents it was 35 percent. Negative net benefit ranging between -1.00 to -5.00 (32 percent) was for Allopathy respondents and it was only -1.00 (6.5 percent) Ayurveda respondents.

Table 24 shows after the discussion on all the relevant variables, it is important to know the factors which discriminate or differentiates between the Ayurveda and Allopathy choice of health care system. For this purpose, discriminant analysis has been employed which is discussed in the following section.

Table 24: Estimated Net Benefits of Ayurveda and Allopathy Respondents

| | AyAI * Net Benefit Cross Tabulation | | | | | | | | | Total |
|--------------|-------------------------------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|--------------|
| | -5.00 | -4.00 | -3.00 | -2.00 | -1.00 | 0.00 | 1.00 | 2.00 | 3.00 | |
| Ayurveda | 0 | 0 | 0 | 0 | 13 | 16 | 69 | 68 | 34 | 200 |
| Allopathy | 1 | 9 | 13 | 16 | 25 | 66 | 51 | 16 | 3 | 200 |
| Total | 1 | 9 | 13 | 16 | 38 | 82 | 120 | 84 | 37 | 400 |

Source: SPSS Output

Discriminant Analysis³

The discriminant analysis (DA) has been used to examine whether respondents find the difference between Ayurveda and Allopathy health care systems on the basis of understanding of facts like whether the health system is holistic, natural, has side effects or not, cost effective, expensive, easily accessible, gives quick relief, slow healing, gives temporary relief or permanent relief, doctors are available or not, scientific or not, has family inheritance of knowledge, whether preventive in approach; results of treatments and; expenditure on health care.

Discriminant analysis was conducted for the two groups:

- Group-1 (Ayurveda)
- Group-2 (Allopathy)

The results of discriminant analysis are presented in Table 25.

The canonical⁴ correlation associated with the function was found to be 0.684. The square of this correlation 0.719 pointed out that 71.9 percent of the variation was explained by the model to the selection of Ayurveda and Allopathy services by the respondents.

The Wilks' Lambda⁵ statistic was used to test the significance of the function. The value of Wilks' Lambda 0.483 which transforms to a chi-square of 248.42 with 19 degrees of freedom ($p<0.000$) shows that the model is significant and explained the respondents' preference of the Ayurveda and Allopathy.

³Discriminant analysis used to model the value of a dependent categorical variable based on its relationship to one or more predictors. It is a multivariate statistical procedure that indicates how adequately a set of variable differentiate between two or more groups.

⁴It is the most important discriminant analysis group, equivalent to Pearson's correlation between the discriminant analyses scores and the group.

⁵ It is measure of how well each function separates cases into groups. Smaller values indicate grater discriminatory ability of the function.

Results in Table 25 indicate that results of treatments is the most significant and discriminating factor with least Wilks' Lambda of 0.483 with highest canonical loading (0.684 or 68.4 percent) followed by no side effects with -0.331 or 33.1 percent, expenditure with -0.322 or 32.2 percent, holistic with -0.311 or 31.1 percent, scientific with 0.280 or 28.0 percent, side effect with -0.263 or 26.3 percent, family inheritance of knowledge with 0.213 or 21.3 percent, natural with -0.173 or 17.3 percent, permanent relief with -.070 or 17 percent, preventive approach with -0.169 or 16.9 percent, temporary relief with -0.135 or 13.5 percent, and doctors are not available with 0.124 or 12.4 percent.

The cross validation classifies all cases but one to develop a discriminant function and then categorizes the case that was left out. This process is repeated with each case left out in turn. This cross validation produces a more reliable function. Most researchers would accept a hit ratio that is 25% larger than that due to chance. Classification results of DA are given in Table 26.

Table 26 shows that 86.5 percent of the cases are correctly classified which is higher than 25 percent; hence it can be concluded that the model has satisfactory predictive powers.

Table 25: Discriminant Analysis Results

| Variables | Wilks' Lambda (λ) | Significance |
|---------------------------------|---|--|
| Holistic | .906 | .000* |
| Natural | .969 | .000* |
| No Side Effect | .895 | .000* |
| Side Effect | .952 | .000* |
| Temporary Relief | .981 | .006* |
| Permanent Relief | .970 | .001* |
| Doctors Not Available | .984 | .011** |
| Scientific | .923 | .000* |
| Family Inheritance of Knowledge | .954 | .000* |
| Preventive Approach | .970 | .001* |
| Results | .666 | .000* |
| Side Effects | .931 | .000* |
| Expenditure | .900 | .000* |
| | Structure Matrix ⁶ (Canonical Loadings) | Unstandardized Canonical Discriminant Function Coefficient |
| Result | .684 | 1.116 |
| No Side Effects | -.331 | -.234 |
| Expenditure | -.322 | -.129 |
| Holistic | -.311 | 1.189 |
| Scientific | .280 | .371 |
| Side Effects | -.263 | -.098 |
| Family Inheritance of Knowledge | .213 | .123 |
| Natural | -.173 | .262 |
| Permanent Relief | -.170 | -.008 |
| Preventive Approach | -.169 | .052 |
| Temporary Relief | -.135 | -.283 |
| Doctors Not Available | .124 | -.059 |
| Constant | | -3.238 |

Canonical correlation-0.719 Wilks' Lambda (λ) -0.483 Chi-square $\chi^2(19df)$ 280.42 p<0.000

Note: * Significant at 1 percent, ** Significant at 5 percent

Source: Source: Compiled from DA Result Tables from SPSS

⁶Structure matrix: This matrix shows the correlation of each predictor variables with the discriminant function.

Table 26: Classification Results

| Actual Groups | Number of cases | Predicted Group | |
|---------------|-----------------|-----------------|------------|
| | | Ayurveda | Allopathy |
| Ayurveda | 200 | 175 (87.5) | 25 (12.5) |
| Allopathy | 200 | 29 (14.5) | 171 (85.5) |

Percent of cases correctly classified: 86.5 percent

Source: DA Result Tables from SPSS

CONCLUSIONS

The average expenditures incurred on various treatments under Ayurveda health care is lower than that of Allopathy for all duration of treatments, IPD and OPD. 52.5 percent of Ayurveda respondents had chronic illness whereas in case of Allopathy it was 46 percent. The respondents with chronic illness were more in Ayurveda health care.

In case of respondents who had earlier received treatment under a different system of medicine than the present choice, 94.45 percent of the respondents who were presently on Ayurveda health care had received Allopathy treatment earlier, whereas only 4.4 percent of respondents who were currently on Allopathy care had earlier received Ayurveda treatment. The statistical results show that the present choice of health care is significantly influenced by the earlier treatment variables – system of medicine, results and expenditure. This clearly shows that the shift in the choice of health care is due to the earlier treatment results and expenditure incurred during earlier expenditure. This implies the unsustainability factors of earlier chosen system of health care.

The side effects were experienced by 13 percent of Allopathy respondents and no Ayurveda respondent reported side effects. The treatment of side effects created additional burden on the respondents which is again unsustainable.

The mean score of treatment results was higher for Ayurveda than for Allopathy. The results of Ordinal Logistic Regression show that treatment results were influenced by choice of health care, duration of illness, side effects and expenditure on them.

The lowest net benefit for Ayurveda respondents was -1.00 and it was -5.00 for Allopathy respondents. 75.5 percent of Ayurveda respondents had positive net benefits whereas it was 35 percent for Allopathy respondents. This strikingly indicates the advantage of Ayurveda system of medicine or health care with sustainability factors considered for the study.

The discriminant analysis results indicate that the most discriminating factor discriminating between Ayurveda and Allopathy system was results of treatment followed by no side effects, and expenditure on treatments.

Conventional Healthcare or Allopathy system of medicine is undoubtedly a choice in emergency medical situations, but as a choice for other chronic medical conditions when compared with Ayurveda and looked through the prism of sustainable perspective, Ayurveda system of healthcare turns out to be a better choice.

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