Health Economics Estimation of Treatment Cost and Length of Stay Considering Laboratory Investigations in Diabetes with Co-Existing Hypertension Hospitalized Patients: Factorial Analysis Model

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Abstract

Objective: The factorial analysis of different variables like length of stay, overall cost of the treatment, cost of medical supplies and equipment, cost of diagnostic tests, cost of the drug, lipid profile, glycaemic profile, and hypertensive profile investigations on admission is performed. The objective of this study is to estimate treatment cost and length of stay considering laboratory investigations in diabetes with co-existing hypertension hospitalized patients.

Methods: In a prospective observational study, all the patients who were referred to the medicine department of the three different hospitals located in Punjab, India and those who were hospitalized due to diabetes mellitus (Type-I and Type-II with co-existing hypertension) were asked to participate in the study.

Results: The patients' mean age was found to be M=(53.85), SD=(11.54) years. Out of 1914 patients, 914 were male (47.8%), followed by female 1000 (53.65%). The factorability of the 16 items was examined. It was observed that 14 variables are loaded onto factor 1. All 14 variables related the length of stay, cost of treatment, and other lab investigations, and vice versa.

Discussion: This study explored the positive correlation between blood glucose profile fasting blood sugar, random blood sugar and HbA1c, with systolic blood pressure, and diastolic blood pressure. The patients' lipid profile includes the cholesterol level of the patients, low-density lipoproteins, triglycerides, very-low-density lipoproteins with a length of stay, cost of drugs used, cost of the diagnostic test, and medical supplies of the patients.

Conclusion: The factorial analysis revealed that length of hospital stay is positively correlated with overall all costs of the treatment, CMS: Cost of Medical Supplies and equipment (INR), CT: Cost of diagnostic Tests (INR), CHO, LDL, TG, VLDL creatinine level, BPS, BPD, FBS, RBS and HbA1c of the patients except CD: Cost of the Drug (INR).

Introduction

Diabetes mellitus with co-existing hypertension contributes to increased morbidity and mortality [1].

Factor analysis would be an ideal instrument to identify a small number of underlying risk factors or to see whether specific risk factors tend to form patterns [2]. As factor analysis is the data reduction method, the methods chosen are iterated principal axis factors with sixteen factors as our method of extraction, comparison, and a varimax rotation [3-5]. The factor analysis is performed to reduce the number of variables

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KEYWORDS

- Factorial analysis length of stay
- Cost of medical supplies and equipment
- Cost of diagnostic tests
- Cholesterol level of the patients
- High-density lipoproteins
- Low-density ipoproteins
- Triglycerides
- Very-low-density lipoproteins
- Blood pressure systolic
- Blood pressure diastolic
- Fasting bold sugar
- Random bold sugar

to explain and interpret the results. The factorial analysis was also used to investigate variable relationships such as length of stay in days, the drug's overall cost, lab values, and investigations [6,7].

The purpose of this study is to compare and correlate variables like length of stay in days, the pharmacoeconomic parameters like overall cost of the treatment, cost of medical supplies and equipment, cost of diagnostic tests, and cost of the drug. The study aim is also to correlate lab investigation which includes the lipid profile of the patients: cholesterol level of the patients, HDL in mg/dL of the patient, LDL in mg/dL of the patient, triglyceride level in mg/dL of the patient, VLDL levels in mg/dL of the patient. The hypertensive lab investigations like creatinine levels in mg/dL, systolic BP of the patient on admission, and diastolic BP of the patient during admission were also studied. The patient's fasting blood sugar at admission, the patient's random blood sugar at admission, and the HbA1c measurement of the patient on admission were also included in the factorial analysis to determine the correlation with other patient variables suffering from diabetes mellitus with co-existing hypertension. All the pharmacoeconomic parameters are reported in INR and US$.

Materials and Methods

In this observational study, all the patients referred to the medicine department of the three different hospitals located in Punjab, India and those hospitalized due to diabetes mellitus (type-I and type-II with co-existing hypertension from April 2017 to August 2020 were asked to participate in the study. The current paper is part of the ongoing study.

The sample size is calculated with the 'Epi Info' software [8,9]. A total of 2621 patients suffering from Diabetes Mellitus (DM) and Hypertension (HTN) were screened during the study period. Out of the 2621 patients, 1913 patients were enrolled in the statistical analysis. A total of 708 patients were excluded while analysing because of missing data; some patients were lost during the follow-up. Thus, a total sum of 1913 patients was included in the final analysis. The content validity of the questionnaire was confirmed by the experts in the diabetes and hypertension field. The lab investigations like HDL in mg/dL of the patient, LDL in mg/dL of the patient, triglyceride level in mg/dL of the patient, VLDL

levels in mg/dL of the patient, creatinine levels in mg/dL, BP systolic of the patient on admission, BP diastolic of the patient admission, fasting the patient at admission, the random blood sugar of the patient at admission, HbA1c measurement of the patient were recorded during the study. A pre-developed and validated tool (DCF and PIC) data collection form and patients' informed consent was used to collect patient data. Patients diagnosed with diabetes mellitus and hypertension with or without complications admitted to (IPD) In-Patient Department of the hospital. The study's inclusion criteria include patients visiting the hospital for follow-up, both genders with age >18 years, and diabetes and hypertension. The exclusion criteria include that patients were not willing to participate in the study.

Institutional ethics committee approved the study of ISF college of pharmacy, Moga, Punjab. The confidence interval of the study was selected as 97%. All statistical tests were carried out at the two sided 3% significance level by statistical analysis software SPSS ver. 25.

The study data collection form includes a questionnaire containing 105 variables. The eighteen variables were chosen for this factorial analysis. The cronbach coefficient alpha of the questionnaire was calculated before the study. The internal consistency reliability of the questionnaire was 0.86.

Results

The mean age of the patients suffering from diabetes mellitus (type-I and type-II) with co-existing hypertension (μ) and Standard Deviation (SD) was found to be M=53.85, SD=11.54 years. The normality test was performed, which was found normally distributed Kolmogorov-Smirnov and Shapiro-Wilk (p=0.36 and 0.223), respectively. Our 1914 patients 914 were male (47.8%), followed by female 999 (53.65%).

The factorial analysis of different variables like length of stay in days, the overall cost of the treatment, cost of medical supplies and equipment's, cost of diagnostic tests, cost of the drug, cholesterol level of the patients, HDL in mg/dL of the patient, LDL in mg/dL of the patient, triglyceride level in mg/dL of the patient, VLDL levels in mg/dL of the patient, creatinine levels in mg/dL, BP systolic of the patient on admission, BP diastolic of the patient admission, fasting blood sugar of the patient at admission, the random blood sugar of the

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patient at admission, HbA1c measurement of the patient on admission is performed. Initially, the factorability of the 16 items was examined.

The descriptive statistics show that (N=1913), the mean length of stay in the hospital for patients suffering from DM and HTN in days was (M=6.43, SD=2.31) days, the overall cost of the treatment (M=22690.0 SD=5768.68) INR. The mean cost of medical supplies (CMS) and equipment (M= 1568.0 SD=284.21) INR, the mean cost of diagnostic (CT) tests (M= 1090.0, SD=192.92) INR, the mean cost of the drug (CD) used to treat DM and HTN is (M=1020.77, SD=527.65) INR. The pharmacoeconomic parameters are also represented in US$, as shown in Table 1.

The descriptive statistics of laboratory investigations revealed that the mean cholesterol level of the patients (M= 251.86, SD=30.75) mg/dL, followed by mean HDL (M=31.11, SD=8.89) mg/dL, LDL (M=176.27, SD=25.36) mg/dL, the mean level of triglyceride (M=219.55, SD=44.82) mg/dL, and mean of VLDL (M=42.43, SD=5.26) mg/dL. The mean serum creatinine (M=2.8, SD=0.90) mg/dL was observed. On the evaluation of the hypertensive profile of the patients, two lab parameters were evaluated. The mean systolic blood pressure was found to be (M=195.03, SD=10.15) mmHg, followed by a mean diastolic blood pressure (M=100.33, SD=8.84) mmHg, which revealed all patients suffering from HTN. On the evaluation of the blood glucose profile of

the patients, it was observed that mean fasting blood sugar (M=272.9 SD=12.15) mg/dL, mean random blood sugar (M=315.9, SD=14.13) mg/dL and mean HbA1c measurement (M=7.91, SD=1.01)%.

The descriptive statistics of the variable included in the factorial analysis are shown in Table 1.

The intercorrelations between the studied variables are presented in Tables 2 and 3. Table 2 represents the correlation matrix results: Correlation, whereas Table 3 represents the correlation matrix: Sig. (1-tailed). The normal ranges for the correlation between -1.0 and +1.0. This indicates the strength of the relationship between the two variables [10,11]. The variables with high intercorrelations could well measure one underlying variable, called 'factor' [12-16]. A value of 0 denotes no linear correlation; positive values denote positive linear correlation, whereas negative values denote negative linear correlation [17]. The value of 'r' 0.00-0.19 will be considered as very weak correlation, 0.20-0.39 as weak correlation, 0.40-0.59 as moderate correlation 0.60- 0.79 as strong correlation 0.80-1.0 as very strong correlation [10,11,17,18].

The factorial analysis results Kaiser-Meyer-Olkin and Bartlett's test show that the KMO value (0.880)the values closer to 1 are preferred better, and the value of 6 is a suggested minimum [3,13,14]. Bartlett's test of sphericity was found significant ($\chi^2(120)=48927.70$, p=0.001) as shown in Tables 5 and 6.

TABLE 1: Factorial analysis: Descriptive statistics.

Variable	Mean	Std. Deviation	Analysis N
Age (mean) (years)	53.85	11.54	1913
Gender (%)	914	47.8*	1913
Length of stay (days)	6.43	2.31	1913
Overall cost of the treatment (INR)	22689.98	5768.68	1913
Overall cost of the treatment (US$)	309.33	78.64	1913
Cost of medical supplies and equipment's (INR)	1567.86	284.21	1913
Cost of medical supplies and equipment's (US$)	21.37	3.77	1913
Cost of diagnostic tests (INR)	1089.74	192.92	1913
Cost of diagnostic tests (US$)	14.85	2.63	1913
Cost of the drug (INR)	1020.77	527.65	1913
Cost of the drug (US$)	13.54	7	1913
Cholesterol level of the patients (mg/dL)	251.86	30.75	1913
HDL (mg/dL)	31.11	8.89	1913
LDL (mg/dL)	176.27	25.36	1913
Triglyceride (mg/dL)	219.55	44.82	1913
VLDL (mg/dL)	42.43	5.26	1913

Creatinine (mg/dL)	2.79	0.9	1913
BP Systolic (mmHg)	195.03	10.15	1913
BP Diastolic (mmHg)	100.33	8.84	1913
Fasting blood sugar (mg/dL)	272.89	12.15	1913
Random blood sugar (mg/dL)	315.89	14.13	1913
HbA1c measurement (%)	7.91*	1.01	1913

Note: LOS: Length of Stay, CMS: Cost of Medical Supplies and Equipment's (INR), CT: Cost of Diagnostic Tests (INR), CD: Cost of the Drug (INR), CHO: Cholesterol level of the patients, HDL: High-Density Lipoproteins, LDL: Low-Density Lipoproteins, TG: Triglycerides, VLDL: Very-Low-Density lipoproteins, BPS: Blood Pressure Systolic, BPD: Blood Pressure Diastolic, FBS: Fasting Bold Sugar, RBG: Random Bold Sugar, INR: INDIAN Rupees, US$: United States dollar.

*Percentage

TABLE 2: Correlation matrix: Correlation.

Test variable		LOS	Overall cost	CMS	CT	CD	CHO	HDL	LDL	TG	VLDL	Creatinine	BPS	BPD	FBS	RBG	HbA1c
Correlation	LOS	1	0.47	0.65	0.65	0.03	0.53	-0.29	0.5	0.52	0.53	0.39	0.26	0.31	0.37	0.37	0.56
	Overall cost	0.47	1	0.25	0.24	0.16	0.11	-0.06	0.14	0.02	0.14	0.23	0.17	0.27	0.32	0.32	0.12
	CMS	0.65	0.25	1	0.99	0.02	0.8	-0.42	0.72	0.79	0.79	0.57	0.36	0.4	0.51	0.51	0.83
	Cost of tests	0.65	0.24	0.99	1	0.01	0.79	-0.41	0.71	0.81	0.79	0.58	0.32	0.37	0.49	0.49	0.83
	Cost of drug	0.03	0.16	0.02	0.01	1	0.02	0	0.04	-0.02	0.03	0.02	0.05	0.06	0.07	0.07	0.01
	CHO	0.53	0.11	0.8	0.79	0.02	1	-0.48	0.94	0.89	0.92	0.47	0.36	0.42	0.51	0.51	0.96
	HDL	-0.29	-0.06	-0.42	-0.41	0	-0.48	1	-0.46	-0.46	-0.51	-0.27	-0.28	-0.26	-0.29	-0.29	-0.52
	LDL	0.5	0.14	0.72	0.71	0.04	0.94	-0.46	1	0.8	0.85	0.43	0.34	0.39	0.49	0.49	0.87
	TG	0.52	0.02	0.79	0.81	-0.02	0.89	-0.46	0.8	1	0.86	0.5	0.22	0.21	0.26	0.26	0.94
	VLDL	0.53	0.14	0.79	0.79	0.03	0.92	-0.51	0.85	0.86	1	0.49	0.34	0.44	0.52	0.52	0.95
	Creatinine	0.39	0.23	0.57	0.58	0.02	0.47	-0.27	0.43	0.5	0.49	1	0.18	0.23	0.29	0.29	0.5
	BPS	0.26	0.17	0.36	0.32	0.05	0.36	-0.28	0.34	0.22	0.34	0.18	1	0.49	0.61	0.61	0.34
	BPD	0.31	0.27	0.4	0.37	0.06	0.42	-0.26	0.39	0.21	0.44	0.23	0.49	1	0.79	0.79	0.41
	FBS	0.37	0.32	0.51	0.49	0.07	0.51	-0.29	0.49	0.26	0.52	0.29	0.61	0.79	1	1	0.49
	RBS	0.37	0.32	0.51	0.49	0.07	0.51	-0.29	0.49	0.26	0.52	0.29	0.61	0.79	1	1	0.49
	HbA1c	0.56	0.12	0.83	0.83	0.01	0.96	-0.52	0.87	0.94	0.95	0.5	0.34	0.41	0.49	0.49	1

Note: LOS: Length of Stay, CMS: Cost of Medical Supplies and Equipment's (INR), CT: Cost of Diagnostic Tests (INR), CD: Cost of the Drug (INR), CHO: Cholesterol Level of the patients, HDL: High-Density Lipoproteins, LDL: Low-Density Lipoproteins, TG: Triglycerides, VLDL: Very-Low-Density Lipoproteins, BPS: Blood Pressure Systolic, BPD: Blood Pressure Diastolic, FBS: Fasting Bold Sugar, RBS: Random Bold Sugar.

The factorial analysis results: Correlation matrix shows that 'r'=0.80-1.0 as a very strong correlation between CT with CMS, TG, and HbA1c. Simultaneously, 'r'=0.80-1.0 CHO with LDL, TG, VLDL, and HbA1c. The length of stay is compared with all remaining fifteen variables; it was observed that (0.40-0.59) moderate correlation found between LOS and overall cost, LDL, TG, VLDL, and HbA1c. Whereas (0.60-0.79) strong correlation is observed between LOS with CMS, CT.

The negative correlation is found in HDL with all fifteen variables. The variable cost of the drugs shows 0.00-0.19 considered as very weak with most of the variables. The data of correlation is represented in Table 2.

The results of the factorial analysis: Correlation matrix, sig. Table 3 shows the significant results obtained in most of the variables except the cost of drugs with LOS, CMS, CT, CHO, LDL, TG, VLDL, creatinine, BPS, BPD. Whereas the significant results were obtained cost of the drug with LDL (p=0.30), BPS (p=0.01), BPD (p=0.004), FBS (p=0.001), RBS (p=0.001). The data of the correlation matrix, significant, is shown in Table 3.

The inverse of the correlation matrix shows a negative correlation [19]. It represents one variable's value is high, then the value of the other variable is probably low. We can see that most items have some inverse correlation with each other. The data is represented in Table 4.

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TABLE 3: Correlation matrix: Sig. (1-tailed)

Test variable		LOS	Overall cost	CMS	Cost of tests	Cost of drug	CHO	HDL	LDL	TG	VLDL	Creatinine	BPS	BP D	FBS	RBG	HbA1c
Sig. (1-tailed)	LOS	-	.001*	.001*	.001*	0.087	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*
	Overall cost	.001*	-	.001*	.001*	.001*	.001*	.004*	.001*	0.243	.001*	.001*	.001*	.001*	.001*	.001*	.001*
	CMS	.001*	.001*	-	.001*	0.197	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*
	Cost of tests	.001*	.001*	1	-	0.414	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*
	Cost of drug	0.087	.001*	0.197	0.414	-	0.186	0.448	0.03	0.257	0.069	0.204	0.013	.004*	.001*	.001*	0.276
	CHO	.001*	.001*	.001*	.001*	0.186	-	.001*	.001*	1	1	.001*	.001*	.001*	.001*	.001*	.001*
	HDL	.001*	.001*	.001*	.001*	0.448	.001*	-	.001*	1	1	.001*	.001*	.001*	.001*	.001*	.001*
	LDL	.001*	.001*	.001*	.001*	0.03	.001*	.001*	-	1	1	.001*	.001*	.001*	.001*	.001*	.001*
	TG	.001*	0.243	.001*	.001*	0.257	.001*	.001*	.001*	-	1	.001*	.001*	.001*	.001*	.001*	.001*
	VLDL	.001*	.001*	.001*	.001*	0.069	.001*	.001*	.001*	.001*	-	.001*	.001*	.001*	.001*	.001*	.001*
	Creatinine	.001*	.001*	.001*	.001*	0.204	.001*	.001*	.001*	.001*	.001*	-	.001*	.001*	.001*	.001*	.001*
	BPS	.001*	.001*	.001*	.001*	.013*	.001*	.001*	.001*	.001*	.001*	.001*	-	.001*	.001*	.001*	.001*
	BPD	.001*	.001*	.001*	.001*	.004*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	-	.001*	.001*	.001*
	FBS	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	-	.001*	.001*
	RBS	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	-	.001*
	HbA1c	.001*	.001*	.001*	.001*	0.276	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	.001*	-

Note:*Significant= 0.03
LOS: Length of Stay, CMS: Cost of Medical Supplies and Equipment's (INR), CT: Cost of Diagnostic Tests (INR), CD: Cost of the Drug (INR), CHO: Cholesterol level of the patients, HDL: High-Density Lipoproteins, LDL: Low-Density Lipoproteins, TG: Triglycerides, VLDL: Very-Low-Density Lipoproteins, BPS: Blood Pressure Systolic, BPD: Blood Pressure Diastolic, FBS: Fasting Bold Sugar, RBG: Random Bold Sugar.

TABLE 4: Inverse of correlation matrix.

Variable	LOS	Overall cost	CMS	Cost of tests	Cost of drug	CHO	HDL	LDL	TG	VLDL	Creatinine	BPS	BP D	FBS	RBG	HbA1c
LOS	2.21	-0.81	0.64	-1.61	0.06	0.61	0.02	-0.38	-0.36	0.15	0.08	-0.07	-0.09	1.09	-1.03	-0.41
Overall cost	-0.81	1.6	-0.54	0.28	-0.18	0.56	-0.07	-0.3	1.23	0.02	-0.23	0.02	-0.04	-0.66	0.63	-0.87
CMS	0.64	-0.54	56.94	-55.55	-0.56	-3.11	0.57	0.66	4.89	-0.04	0.32	-2.05	-0.45	5.77	-4.89	-3.09
Cost of tests	-1.61	0.28	-55.55	59.01	0.62	1.96	-0.61	0.12	-7.91	-0.34	-0.97	2.08	0.63	-6.46	4.34	4.1
Cost of drug	0.06	-0.18	-0.56	0.62	1.04	0.17	-0.03	-0.15	-0.07	-0.13	0.01	0.01	0.01	-0.26	0.22	0.08
CHO	0.61	0.56	-3.11	1.96	0.17	30.9	-1.17	-13.04	0.86	-0.02	0.17	-0.46	0.05	-2.35	2.19	-19.03
HDL	0.02	-0.07	0.57	-0.61	-0.03	-1.17	1.46	0.51	-0.31	0.23	0.05	0.21	0.05	-0.81	0.64	1.52
LDL	-0.38	-0.3	0.66	0.12	-0.15	-13.04	0.51	9.9	-0.54	-0.89	0.01	0.11	0.11	1.39	-1.64	5.15
TG	-0.36	1.23	4.89	-7.91	-0.07	0.86	-0.31	-0.54	19.65	1.74	-0.55	-0.75	0.63	-0.98	5.76	-20.15
VLDL	0.15	0.02	-0.04	-0.34	-0.13	-0.02	0.23	-0.89	1.74	10.28	-0.19	0.25	-0.33	1.49	-1.6	-10.01
Creatinine	0.08	-0.23	0.32	-0.97	0.01	0.17	0.05	0	-0.55	-0.19	1.56	0.04	-0.02	0.43	-0.54	0.35
BPS	-0.07	0.02	-2.05	2.08	0.01	-0.46	0.21	0.11	-0.75	0.25	0.04	1.73	-0.07	-1.29	0.22	0.89
BPD	-0.09	-0.04	-0.45	0.63	0.01	0.05	0.05	0.11	0.63	-0.33	-0.02	-0.07	2.71	-3.04	1.19	-0.65
FBS	1.09	-0.66	5.77	-6.46	-0.26	-2.35	-0.81	1.39	-0.98	1.49	0.43	-1.29	-3.04	961.17	-957.53	-0.67
RBS	-1.03	0.63	-4.89	4.34	0.22	2.19	0.64	-1.64	5.76	-1.6	-0.54	0.22	1.19	-957.53	958.66	-3.61
HbA1c	-0.41	-0.87	-3.09	4.1	0.08	-19.03	1.52	5.15	-20.15	-10.01	0.35	0.89	-0.65	-0.67	-3.61	45.33

NOTE:*LOS: Length of Stay, CMS: Cost of Medical Supplies and equipment's (INR), CT: Cost of Diagnostic Tests (INR), CD: Cost of the Drug (INR), CHO: Cholesterol level of the patients, HDL: High-Density Lipoproteins, LDL: Low-Density Lipoproteins, TG: Triglycerides, VLDL: Very-Low-Density Lipoproteins, BPS: Blood Pressure Systolic, BPD: Blood Pressure Diastolic, FBS: fasting Bold Sugar, RBG: Random Bold Sugar.

TABLE 5: KMO and Bartlett's Test.

Kaiser-Meyer-Olkin measure of sampling adequacy		0.88
Bartlett's test of sphericity	Approx. *Chi-square*	48927.7
	df	120
	Sig.	0.001

TABLE 6: Factorial analysis: Communalities.

Variable	Initial	Extraction
LOS	1	0.67
Overall cost	1	0.77
CMS	1	0.85
Cost of tests	1	0.85
Cost of drug	1	0.16
CHO	1	0.92
HDL	1	0.36
LDL	1	0.8
TG	1	0.93
VLDL	1	0.89
Creatinine	1	0.45
BPS	1	0.56
BPD	1	0.75
FBS	1	0.93
RBS	1	0.93
HbA1c	1	0.95

Extraction method: Principal component analysis.

The commonality is the sum of the squared component loadings up to the number of components you extract.

In the scree plot of factorial analysis, we could find the point of inflexion. The results from the scree plot and the eigenvalues suggests a three component solution may be the best.

The component matrix table revealed that only 3 components extracted. The extraction method, which was used, is principal component analysis. The data of the component matrix is presented in Table 7. It was observed that 14 variables are loaded onto factor 1. It is clear from Table 7 that these 14 variables all relate to the length of stay, cost of treatment, and affecting other lab investigations vice versa. Three variables, BPD, FBS, RBS, load onto a second factor related to each other. The only two variables that load onto factor 3 relate RBS and HbA1c (Table 8).

TABLE 7: Component matrix[a]

Variable	Component		
	1	2	3
LOS	0.93	-	-
Overall cost	0.92	-	-
CMS	0.92	-	-
Cost of tests	0.9	-	-
Cost of drug	0.89	-	-
CHO	0.87	-	-
HDL	0.83	-0.48	-

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LDL	0.69	0.66	-
TG	0.69	0.66	-
VLDL	0.67	-	0.48
Creatinine	0.58	-	-
BPS	-0.54	-	-
BPD	0.58	0.62	-
FBS	0.5	0.51	-
RBS	-	0.38	0.73
HbA1c	-	-	0.36

Extraction method: Principal component analysis. a. 3 components extracted.

Note: LOS: Length of STAY, CMS: Cost of Medical Supplies and Equipment's (INR), CT: Cost of Diagnostic Tests (INR), CD: Cost of the Drug (INR), CHO: Cholesterol level of the patients, HDL: High-Density Lipoproteins, LDL: Low-Density Lipoproteins, TG: Triglycerides, VLDL: Very-Low-Density Lipoproteins, BPS: Blood Pressure Systolic, BPD: Blood Pressure Diastolic, FBS: Fasting Bold Sugar, RBG: Random Bold Sugar.

TABLE 8: Total variance explained.

Component	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	8.32	52	52	8.32	52	52	6.78	42.4	42.4
2	2.19	13.69	65.69	2.19	13.69	65.69	3.43	21.46	63.86
3	1.25	7.79	73.48	1.25	7.79	73.48	1.54	9.62	73.48
4	0.97	6.07	79.55	-	-	-	-	-	-
5	0.73	4.54	84.09	-	-	-	-	-	-
6	0.66	4.11	88.2	-	-	-	-	-	-
7	0.56	3.49	91.69	-	-	-	-	-	-
8	0.43	2.68	94.37	-	-	-	-	-	-
9	0.33	2.03	96.4	-	-	-	-	-	-
10	0.27	1.66	98.06	-	-	-	-	-	-
11	0.17	1.03	99.1	-	-	-	-	-	-
12	0.09	0.54	99.64	-	-	-	-	-	-
13	0.03	0.21	99.85	-	-	-	-	-	-
14	0.02	0.09	99.94	-	-	-	-	-	-
15	0.01	0.05	100	-	-	-	-	-	-
16	0	0	100	-	-	-	-	-	-

Extraction method: Principal component analysis.

Total variance explained that only not all sixteen factors were retained. This study observed that only the first three factors were retained, as represented in Table 8. Eigenvalues are the variances of the factors as we have conducted the factor analysis based on the correlation matrix, each variable has a value of 1, and most of the variables are standardized, so total variance was found to be 16. The Table shows that the total eigenvalues' value was found in factor 01 (8.32)

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52.00% of variance and factor 02 (2.19) 13.69 % of variance followed by a decrease in factor observed a decrease invariance. The cumulative percentage of initial eigenvalues for factor 1 was (52.0 %) and factor 02 (65.69%). The squared loadings column's extraction sums indicate that the number of factors retained in the analysis as 03 factors is retailed. The last factor that was retained was 03, (1.25) 7.79 %, with 73.48 of cumulative %. Initial eigenvalues indicated that the first three factors explained 52%, 13%, and 7% of the variance, respectively. The fourth factor had eigenvalues just closer to one and explained 6.07% of the variance.

The plot component plot of factors 1, 2, and 3 in the factorial analysis Figures 1 and 2 shows the items (variables) are organized in the common rotated factor space.

Table 9 rotated component matrix[a] shows the rotated factor loadings; the data represent each factor's three weighted variables. The Table 9 also represents the correlation between the variables (16) and factor 3 (component).

The plot component plot of factors 1, 2, and 3 in factorial analysis shows that the items (variables) are organized in the common rotated factor space.

Table 9 rotated component matrixa shows the rotated factor loadings; the data represent each factor's three weighted variables. The Table also represents the correlation between the variables (16) and factor 3 (component). It was found that in factor 1, 10 items (variable) such as TG, HbA1c, CHO, VLDL, Cost of diagnostic tests, CMS, LDL, LOS, Creatinine, and HDL (-0.52) retained. In factor 2, only 4 items (variable) FBS, RBS, BPD, BPS are retained under-rotated component matrix[a].
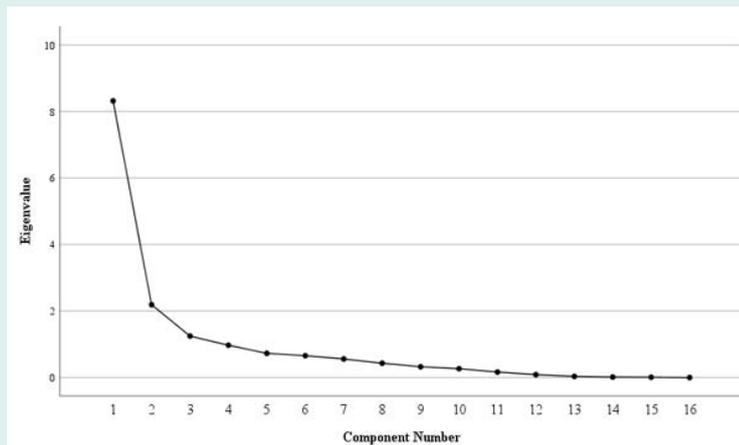

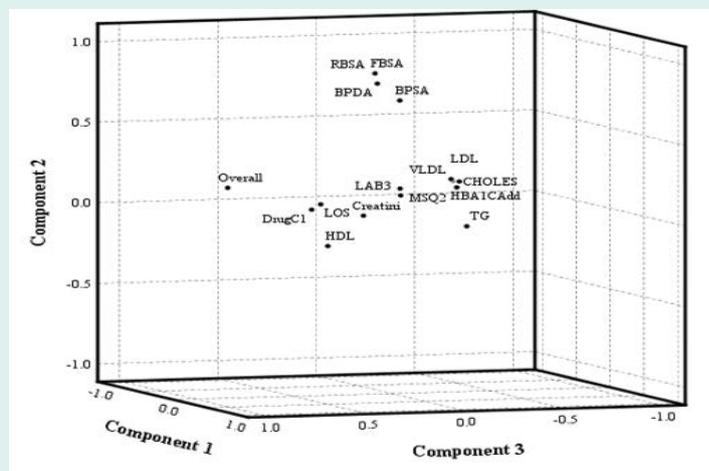**FIGURE 1. Scree Plot of factorial analysis.**

FIGURE 2. The component plot of factor 1, 2, and 3 in factorial analysis.

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TABLE 9: Rotated component matrix[a].

Variable	Component		
	1	2	3
TG	0.96	-	-
HbA1c	0.93	-	-
CHO	0.91	-	-
VLDL	0.89	0.3	-
Cost of diagnostic tests	0.86	-	-
CMS	0.85	-	-
LDL	0.84	-	-
LOS	0.58	-	0.56
Creatinine	0.57	-	0.33
HDL	-0.52	-	-
FBS	-	0.9	-
RBS	-	0.9	-
BPD	-	0.83	-
BPS	-	0.72	-
Overall cost	-	-	0.85
Cost of drug	-	-	0.39

Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser normalization. a. Rotation converged in 5 iterations.

TABLE 10: Factorial analysis: Reproduced correlations.

	Test variable	LOS	Cost	CMS	CT	CD	CHO	HDL	LDL	TG	VLDL	Creatinine	BPS	BPD	FBS	RBG	HbA1c
Correlation	LOS	.672a	0.54	0.67	0.67	0.2	0.56	-0.26	0.52	0.53	0.56	0.53	0.22	0.31	0.38	0.38	0.58
	Overall cost	0.54	.766a	0.31	0.3	0.34	0.08	0.05	0.09	0.01	0.11	0.33	0.17	0.29	0.35	0.35	0.09
	CMS	0.67	0.31	.852a	0.85	0.07	0.85	-0.47	0.79	0.81	0.84	0.59	0.34	0.41	0.51	0.51	0.86
	Cost of tests	0.67	0.3	0.85	.851a	0.07	0.84	-0.47	0.79	0.82	0.83	0.59	0.31	0.38	0.47	0.47	0.86
	Cost of drug	0.2	0.34	0.07	0.07	.156a	-0.04	0.07	-0.03	-0.06	-0.03	0.11	0.03	0.08	0.09	0.09	-0.04
	CHO	0.56	0.08	0.85	0.84	-0.04	.923a	-0.56	0.86	0.89	0.9	0.53	0.38	0.42	0.51	0.51	0.94
	HDL	-0.26	0.05	-0.47	-0.47	0.07	-0.56	.355a	-0.52	-0.52	-0.54	-0.27	-0.27	-0.29	-0.34	-0.34	-0.56
	LDL	0.52	0.09	0.79	0.79	-0.03	0.86	-0.52	.804a	0.82	0.84	0.5	0.36	0.41	0.49	0.49	0.87
	TG	0.53	0.01	0.81	0.82	-0.06	0.89	-0.52	0.82	.928a	0.86	0.53	0.19	0.2	0.27	0.27	0.91
	VLDL	0.56	0.11	0.84	0.83	-0.03	0.9	-0.54	0.84	0.86	.887a	0.53	0.38	0.43	0.52	0.52	0.92
	Creatinine	0.53	0.33	0.59	0.59	0.11	0.53	-0.27	0.5	0.53	0.53	.445a	0.15	0.21	0.27	0.27	0.55
	BPS	0.22	0.17	0.34	0.31	0.03	0.38	-0.27	0.36	0.19	0.38	0.15	.557a	0.64	0.71	0.71	0.36
	BPD	0.31	0.29	0.41	0.38	0.08	0.42	-0.29	0.41	0.2	0.43	0.21	0.64	.754a	0.84	0.84	0.4
	FBS	0.38	0.35	0.51	0.47	0.09	0.51	-0.34	0.49	0.27	0.52	0.27	0.71	0.84	.929a	0.93	0.49
	RBS	0.38	0.35	0.51	0.47	0.09	0.51	-0.34	0.49	0.27	0.52	0.27	0.71	0.84	0.93	.928a	0.49
	HbA1c	0.58	0.09	0.86	0.86	-0.04	0.94	-0.56	0.87	0.91	0.92	0.55	0.36	0.4	0.49	0.49	.950a

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		LOS	Overall cost	CMS	Cost of tests	Cost of drug	CHO	HDL	LDL	TG	VLDL	Creatinine	BPS	BPD	FBS	RBS	HbA1c
	LOS	-	-0.07	-0.03	-0.02	-0.17	-0.03	-0.03	-0.02	-0.01	-0.03	-0.14	0.04	0.01	-0.01	-0.01	-0.02
	Overall cost	-0.07	-	-0.05	-0.06	-0.18	0.03	-0.11	0.05	0.01	0.03	-0.1	0	-0.02	-0.03	-0.03	0.03
	CMS	-0.03	-0.05	-	0.14	-0.05	-0.05	0.05	-0.07	-0.02	-0.05	-0.02	0.02	-0.01	0.01	0.01	-0.04
	Cost of tests	-0.02	-0.06	0.14	-	-0.06	-0.05	0.06	-0.08	-0.01	-0.05	-0.01	0.01	-0.01	0.02	0.02	-0.04
	Cost of drug	-0.17	-0.18	-0.05	-0.06	-	0.06	-0.07	0.08	0.05	0.06	-0.09	0.02	-0.02	-0.02	-0.02	0.05
	CHO	-0.03	0.03	-0.05	-0.05	0.06	-	0.08	0.08	0.01	0.01	-0.06	-0.02	0.01	0.01	0.01	0.03
	HDL	-0.03	-0.11	0.05	0.06	-0.07	0.08	-	0.05	0.05	0.03	0.01	-0.02	0.03	0.05	0.05	0.04
Sig. (1-tailed)	LDL	-0.02	0.05	-0.07	-0.08	0.08	0.08	0.05	-	-0.02	0.01	-0.07	-0.02	-0.01	-0.01	-0.01	0.01
	TG	-0.01	0.01	-0.02	-0.01	0.05	0.01	0.05	-0.02	-	0.01	-0.04	0.03	0.01	-0.01	-0.01	0.03
	VLDL	-0.03	0.03	-0.05	-0.05	0.06	0.01	0.03	0.01	0	-	-0.04	-0.05	0.01	0.01	0	0.03
	Creatinine	-0.14	-0.1	-0.02	-0.01	-0.09	-0.06	0	-0.07	-0.04	-0.04	-	0.03	0.02	0.02	0.02	-0.05
	BPS	0.04	0	0.02	0.01	0.02	-0.02	-0.02	-0.02	0.03	-0.05	0.03	-	-0.15	-0.1	-0.1	-0.02
	BPD	0.01	-0.02	-0.01	-0.01	-0.02	0.01	0.03	-0.01	0.01	0.01	0.02	-0.15	-	-0.05	-0.05	0.01
	FBS	-0.01	-0.03	0.01	0.02	-0.02	0.01	0.05	-0.01	-0.01	0.01	0.02	-0.1	-0.05	-	0.07	0.01
	RBS	-0.01	-0.03	0.01	0.02	-0.02	0.01	0.05	-0.01	-0.01	0.01	0.02	-0.1	-0.05	0.07	-	0.01
	HbA1c	-0.02	0.03	-0.04	-0.04	0.05	0.03	0.04	0.01	0.03	0.03	-0.05	-0.02	0.01	0.01	0.01	-

There are 33 (27.0%) nonredundant residuals with absolute values greater than 0.03.

Extraction method: Principal component analysis. Reproduce commonalities residuals are computed between observed and reproduced correlations.

The reproduced correlation matrix is obtained by multiplying the loading matrix by the transposed loading matrix. Factor rotation alters the factor loadings pattern and can improve interpretation [20]. The data of factorial analysis: Reproduced correlations are represented in Table 10.

Discussion

The factorial analysis results Kaiser-Meyer-Olkin and Bartlett's Test show that KMO value (0.880) the values closer to 1 are preferred better, and the value of 0.6 is a suggested minimum [3,13,14]. Bartlett's test of sphericity was significant (χ^2 (120)=48927.70, p=0.001). The results indicate that Bartlett's Test was significant; it means the factorial analysis is appropriate.

This study explored the positive correlation between blood glucose profile (FBS: Fasting Bold Sugar, RBG: Random Bold Sugar and HbA1c), the hypertensive profile of the patients (BPS: Blood Pressure Systolic, BPD: Blood Pressure Diastolic), the lipid profile of the patients (CHO: Cholesterol level of the patients, LDL: Low-Density Lipoproteins, TG: Triglycerides, VLDL: Very-Low-Density Lipoproteins) with a length of stay, cost of drugs used, cost of diagnostic test and medical supplies of the patients. Similar results were obtained in the study conducted by Alaviet, et al.

Our research showed a negative correlation between HDL: High-Density Lipoproteins with a length of stay, cost of the diagnostic test, and medical supplies of the

The pharmacoeconomic variable like overall cost of the treatment, mean cost of medical supplies and equipment's, mean cost of the diagnostic test, mean Cost of the Drug (CD) used to treat DM and HTN is compared with the previous studies.

The overall cost of the treatment in our study was found 22690.0 (INR), 309.33 (US$) whereas our study demonstrates that patients spend an average cost of medical supplies and equipment's 1567.86 (INR), 21.37 (US$) as compared to study conducted by Chandra, Pet, et al., 1322.0 (INR). The cost of the diagnostic test in our study was found to be 1089.74 (INR), 14.85 (US$) as compared to study conducted by Hussain, M, et al., 07 (US$) followed by the cost of the drug used to treat DM and HTN in hospital admission was found to be 1020.77 (INR), 13.54 (US$) is compared with the study conducted by Paula De, et al., was (US$) 11.4.

The lab parameters like the mean cholesterol level of the patients during admission in our study were found 251.86 (mg/dL) as compared to a study conducted by Mendhe H, et al., 236 (mg/dL). The HDL level in our study was found to be 31.11 (mg/dL) as compared with the study

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conducted by Cowie, C et al. 29.0 (mg/dL). The LDL in our study was found to be 176.27 (mg/dL); similar results were found when compared with White F, et al., Our study's creatinine level was found to be 2.79 (mg/dL) is the most important marker for diabetic nephropathy. The men BP systolic in our study was found to be 195.03 (mmHg) and mean BP diastolic 100.33 (mmHg), which indicates the most of the patients suffering from stage II high blood pressure (hypertension).

The mean of fasting blood sugar in our study was found to be 272.89, whereas random blood sugar was found to be 315.89 (mg/dL) is compared with a study conducted by Raikar S, et al. (2015) FBS:226 (mg/dL) and RBS: 265 (mg/dL). All the patients enrolled in this study is suffering from DM with co-existing HTN and mean HbA1c level was found 7.91 (%) when compared with Zoungas S, et al. (2012) 7.1% difference of 0.81% was observed.

INR. Statistical analysis showed that CMS: Cost of medical supplies and equipment's (INR) is positively correlated to overall all cost of the treatment, CT: Cost of Diagnostic Tests (INR), CHO, LDL, TG, VLDL creatinine level, BPS, BPD, FBS, RBS and HbA1c of the patients except CD: Cost of the drug (INR).

Our study's mean length of stay was found to be 6.43 days, which is low compared to the length of stay reported by Mutowo, et al. (2016) median 8 days. The difference between 1.57 was observed.

Conclusion

The factorial analysis revealed that length of hospital stay is positively correlated with overall all cost of the treatment, CMS: Cost of Medical supplies and equipment's (INR), CT: Cost of diagnostic Tests (INR), CHO, LDL, TG, VLDL creatinine level, BPS, BPD, FBS, RBS and HbA1c of the Patients except CD: Cost of the Drug (INR). The drugs' cost was not significant with the HDL level of the patients suffering from DM and hypertension. The non-significant results also observed in TG with the overall cost, TG with the cost of drugs VLDL with) with cost of the drug, creatinine with cost of the drug, HbA1c with cost of drug The cost of medical supplies and equipment was significant, with almost all the items (variable) used in the factorial analysis except the cost of the drug.

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