Chapter III

Research Methodology
RESEARCH METHODOLOGY

3.1 Introduction

This chapter deals with the methodology followed for carrying out the study. The method of sample selection, data and sources of data, framework of analysis, the hypotheses framed and important terms used in the study are discussed here.

3.2 Sample

The study pertains to Indian corporate hospitals. Data for these hospitals are available in corporate databases, ‘Prowess’, maintained by the Center for Monitoring Indian Economy (CMIE) Pvt. Ltd, Mumbai, India and ‘Capitaline Plus’ of Capital Market Publishers India Pvt. Ltd, Mumbai, India. Fourteen hospitals have been selected for the study. They are given in Table 3.1.

Table 3.1
List of Sample Hospitals

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of Hospital</th>
<th>Abbreviation used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ADS Hospital</td>
<td>ADS</td>
</tr>
<tr>
<td>2</td>
<td>Apollo Hospital Enterprises</td>
<td>Apollo</td>
</tr>
<tr>
<td>3</td>
<td>CDR Healthcare</td>
<td>CDR</td>
</tr>
<tr>
<td>4</td>
<td>Devaki Hospital</td>
<td>Devaki</td>
</tr>
<tr>
<td>5</td>
<td>Dhanvantri Jeevan Hospital</td>
<td>Dhanvantri</td>
</tr>
<tr>
<td>6</td>
<td>Dolphin Medical Centre</td>
<td>Dolphin</td>
</tr>
<tr>
<td>7</td>
<td>Dr. Agarwal’s Eye Hospital</td>
<td>Dr. Agarwal</td>
</tr>
<tr>
<td>8</td>
<td>Indraprastha Hospital</td>
<td>Indraprastha</td>
</tr>
<tr>
<td>9</td>
<td>Kovai Medical Centre and Hospital</td>
<td>KMCH</td>
</tr>
<tr>
<td>10</td>
<td>Malar Hospital</td>
<td>Malar</td>
</tr>
<tr>
<td>11</td>
<td>Medinova Hospital</td>
<td>Medinova</td>
</tr>
<tr>
<td>12</td>
<td>NG Hospital</td>
<td>NG</td>
</tr>
<tr>
<td>13</td>
<td>Seahorse Medicals</td>
<td>Seahorse</td>
</tr>
<tr>
<td>14</td>
<td>Standard Hospital</td>
<td>Standard</td>
</tr>
</tbody>
</table>
3.2.1. Sampling Procedure

The first step in selecting hospitals is the identification of the population from which further selection has been carried out. List of private hospitals available under healthcare industry in the corporate databases constitutes the population. The study units have been chosen on the basis of purposive sampling. Hospitals for which financial statements are available for a ten year period from 1996-97 to 2005-06 have been included in the sample. Initially, 21 hospitals have been identified. But on verification, it has been found that some hospitals have data for the entire study period while others have data for years which do not relate to the study period. Hence, hospitals which have financial information relating to the study period are selected as the sample. The period of study could not be increased for the fear of elimination of many hospitals nor could be reduced since no meaningful inference could be drawn from the analysis. As such, the sample size is to be restricted to fourteen, representing 27 per cent of the population.

3.3 Data and Sources of Data

Data used for the study are secondary in nature. Corporate databases ‘Prowess’ and ‘Capitaline Plus’, which contain the annual reports of the hospitals are the sources of data. Variables used in the study have been selected after a detailed examination of literature available on the research topic and also after consultation with the subject experts. Data for the following items have been collected for the purpose of the study:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Variable</th>
<th>S. No.</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>Current Assets</td>
<td>xi</td>
<td>Current Liabilities</td>
</tr>
<tr>
<td>ii</td>
<td>Quick Assets</td>
<td>xii</td>
<td>Operating Expenses</td>
</tr>
<tr>
<td>iii</td>
<td>Cash and Bank Balance</td>
<td>xiii</td>
<td>Marketable Securities</td>
</tr>
<tr>
<td>iv</td>
<td>Inventory</td>
<td>xiv</td>
<td>Short-term Borrowings</td>
</tr>
<tr>
<td>v</td>
<td>Debtors</td>
<td>xv</td>
<td>Funds Out Flow</td>
</tr>
<tr>
<td>vi</td>
<td>Total Assets</td>
<td>xvi</td>
<td>Cash Inflow</td>
</tr>
<tr>
<td>vii</td>
<td>Fixed Assets</td>
<td>xvii</td>
<td>Long-term Liabilities</td>
</tr>
<tr>
<td>viii</td>
<td>Operating Income</td>
<td>xviii</td>
<td>Reserves and Surplus</td>
</tr>
<tr>
<td>ix</td>
<td>Gross Working Capital</td>
<td>xix</td>
<td>Capital Employed</td>
</tr>
<tr>
<td>x</td>
<td>Net Working Capital</td>
<td>x</td>
<td>Liquid Funds</td>
</tr>
</tbody>
</table>
3.3.1. Adjustment in the Data

The accounting years of the selected hospitals are not uniform. For some of the years, a few hospitals report accounts for a period of 18 months while quite a few others have reported financial data for a shorter period of nine months. To facilitate comparisons, the results are annualized. The hospitals for which data are annualized are Malar and Medinova.

3.4. Framework of Analysis

For the purpose of analysis of data, accounting ratios, statistical tools and few models on working capital are used. The various accounting ratios employed are as below.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Ratios</th>
<th>S. No.</th>
<th>Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>Current Assets to Total Assets</td>
<td>xi</td>
<td>Cash Turnover Ratio</td>
</tr>
<tr>
<td>ii</td>
<td>Current Assets to Gross Fixed Assets</td>
<td>xii</td>
<td>Current Assets Turnover Ratio</td>
</tr>
<tr>
<td>iii</td>
<td>Current Assets to Operating Income</td>
<td>xiii</td>
<td>Working Capital Turnover Ratio</td>
</tr>
<tr>
<td>iv</td>
<td>Net Working Capital to Operating Income</td>
<td>xiv</td>
<td>Comprehensive Liquidity Index</td>
</tr>
<tr>
<td>v</td>
<td>Net working capital to Current Assets</td>
<td>xv</td>
<td>Net Liquid Balance</td>
</tr>
<tr>
<td>vi</td>
<td>Liquid funds to Current Assets</td>
<td>xvi</td>
<td>Health Ratio</td>
</tr>
<tr>
<td>vii</td>
<td>Current Ratio</td>
<td>xvii</td>
<td>Lambda Index</td>
</tr>
<tr>
<td>viii</td>
<td>Quick Ratio</td>
<td>xviii</td>
<td>Leverage</td>
</tr>
<tr>
<td>ix</td>
<td>Inventory Turnover Ratio</td>
<td>xix</td>
<td>Return on Investment</td>
</tr>
<tr>
<td>x</td>
<td>Debtors Turnover Ratio</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In addition to ratios, Gross Working Capital, Net Working Capital, Current Assets, Current Liabilities, Operating Income, Size, and Growth rate have also been used for assessing working capital.
Statistical tools applied include Arithmetic Mean, Standard Deviation, Coefficient of Variation, Analysis of Variance (ANOVA), Discriminant Analysis, Non-linear Second Degree Parabola, Kendall’s Coefficient of Concordance, Chi-square Test, Correlation, Simple Regression, Multiple Regression, Stepwise Regression and Path Analysis.

Popular models on working capital also have been used. They are: (i) Bhattacharya’s Efficiency Index Model, (ii) OLS Model and (iii) Motaal’s Ultimate Test of Comparative Liquidity.

Ratios, statistical tools and models as employed in each chapter are discussed below.

3.4.1. Tools Used - Chapter IV

Trends in working capital have been examined in this chapter. As trend is influenced by size and adequacy of working capital, a three dimensional approach is adopted to examine the data. Size of working capital in corporate hospitals has been measured through gross working capital, net working capital, current assets to total assets, current assets to gross fixed assets, current assets to operating income and net working capital to operating income. Adequacy of working capital is ascertained by performing bi-variate discriminant analysis. Two variables are chosen for this analysis. They are operating expenses and operating income. For evaluating trends in working capital, non-linear second degree parabola technique has been used. Trend equation has been fitted for the following working capital measures:

i. Current Assets to Total Assets Ratio
ii. Current Assets to Gross Fixed Assets Ratio
iii. Current Assets to Net Operating Income Ratio
iv. Current Assets
v. Current Liabilities
vi. Operating Income
vii. Net Working Capital
viii. Working Capital Turnover Ratio
3.4.2. Tools Employed - Chapter V

Effectiveness of working capital management is examined in the fifth chapter. An attempt is made to assess the working capital efficiency of selected hospitals through ratio analysis, Motaals’ Ultimate Test of Comparative Liquidity, Bhattacharya’s Efficiency Index model and OLS model.

Ratios selected for analysis are i) current ratio, ii) quick ratio, iii) inventory turnover Ratio, iv) debtors turnover ratio, v) cash turnover ratio, vi) working capital turnover ratio, vii) current assets turnover ratio, viii) comprehensive liquidity index, ix) net liquid balance, x) health ratio and xi) lambda index. Mean values, coefficient of variation are ascertained for these ratios for comparisons. Standard deviation is used for calculating coefficient variation and for ascertaining Lambda value.

To find out differences among the mean values across years as well as across hospitals, null hypotheses have been framed and tested through ANOVA. They are:

1. $H_0$: Mean values of current ratio do not differ significantly across years and across hospitals
2. $H_0$: Mean values of quick ratio do not differ significantly across years and across hospitals
3. $H_0$: Mean values of inventory turnover ratio do not differ significantly across years and across hospitals
4. $H_0$: Mean values of debtors turnover ratio do not differ significantly across years and across hospitals
5. $H_0$: Mean values of working capital turnover ratio do not differ significantly across years and across hospitals
6. $H_0$: Mean values of cash turnover ratio do not differ significantly across years and across hospitals
7. $H_0$: Mean values of current asset turnover ratio do not differ significantly across years and across hospitals
8. $H_0$: Mean values of comprehensive liquidity index do not differ significantly across years and across hospitals

9. $H_0$: Mean values of net liquid balance do not differ significantly across years and across hospitals

10. $H_0$: Mean values of health ratio do not differ significantly across years and across hospitals

11. $H_0$: Mean values of lambda index do not differ significantly across years and across hospitals

For assessing the overall liquidity, Motaal’s ultimate test of comparative liquidity is employed. Net working capital to current assets ratio, inventory to current assets ratio and liquid funds to current assets are used for ranking. Kendall’s co-efficient of concordance (W) has been computed to assess the degree of uniformity in liquidity of hospitals and Chi – Square test has been applied for testing the significance of Kendall’s coefficient (W). The confidence levels chosen are one, five and ten per cent.

In order to evaluate how the components of individual current assets have performed, how efficiently current assets are utilized and how efficiently such assets are managed, Bhattacharya’s Efficiency Index model is used. This model involves construction of performance index, utilization index and efficiency index.

In addition to this, ability of hospitals in achieving the targeted level of efficiency is measured using OLS model. It is as below.

$$Y_i = \hat{\alpha} + \beta X_i + \hat{\epsilon}_i$$

where,

- $Y_i = Z_t - Z_{t-1}$
- $\hat{\alpha} = \text{Constant}$
- $\beta = \text{Regression coefficient}$
- $\hat{\epsilon}_i = \text{Error Term}$
- $X_i = Z^*_{t-1} - Z_{t-1}$
\[ Z_t = \text{Index at time "t" for the hospital and} \]
\[ Z^* = \text{Average index of the industry at } t-1. \]

### 3.4.3 Tools Used - Chapter VI

Association that may exist between select working capital ratios and profitability as well as value added to capital employed (VACE) is found out in this chapter. To assess the sensitivity of profitability and value added to capital employed (VACE) to working capital, (i) Correlation analysis, (ii) Simple Regression Analysis, (iii) Multiple Regression Analysis (iv) Stepwise Regression Analysis and (v) Path Analysis are employed.

#### i. Correlation Analysis

To measure the association between independent variables representing working capital and profitability for all hospitals put together as well as for individual hospital, correlation technique is used. The independent variables are:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Variable</th>
<th>S. No.</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>Current ratio</td>
<td>viii</td>
<td>Current assets to operating income ratio</td>
</tr>
<tr>
<td>ii</td>
<td>Quick ratio</td>
<td>ix</td>
<td>Comprehensive liquidity index</td>
</tr>
<tr>
<td>iii</td>
<td>Inventory turnover ratio</td>
<td>x</td>
<td>Net liquid balance</td>
</tr>
<tr>
<td>iv</td>
<td>Debtor’s turnover ratio</td>
<td>xi</td>
<td>Size</td>
</tr>
<tr>
<td>v</td>
<td>Working capital turnover ratio</td>
<td>xii</td>
<td>Leverage</td>
</tr>
<tr>
<td>vi</td>
<td>Cash turnover ratio</td>
<td>xiii</td>
<td>Growth rate</td>
</tr>
<tr>
<td>vii</td>
<td>Current assets to total assets ratio</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The dependent variable ‘profitability’ is measured in terms of Return on Investment (ROI) ratio.

The same set of independent variables is used in correlation analysis for measuring the association between different independent variables, representing working
capital, and VACE for all hospitals put together as well as for individual hospitals.
The dependent variable used in this case is VACE.

The confidence levels chosen are one, five and ten per cent.

ii. Simple Regression

In order to determine the influence of working capital on profitability and on VACE of individual hospital simple regression is employed

The confidence levels chosen are one, five and ten per cent.

iii. Multiple Regression Analysis

In order to examine the combined influence of independendent variables on corporate hospitals profitability, the selected variables have been regressed on profitability. Regression equation framed is as below:

\[
\text{ROI}_t = a + b_1 \text{CR}_t + b_2 \text{QR}_t + b_3 \text{ITR}_t + b_4 \text{DTR}_t + b_5 \text{WCTR}_t + b_6 \text{CTR}_t + b_7 \text{CAT}_t + b_8 \text{CAO}_t + b_9 \text{CLI}_t + b_{10} \text{NLB}_t + b_{11} \text{GR}_t + b_{12} \text{Lev}_t + b_{13} \text{size}_t + e
\]

where,

\[
\begin{align*}
\text{ROI} & = \text{Return on investment} \\
a & = \text{Intercept term} \\
b_1...b_{13} & = \text{Regression coefficients} \\
t & = \text{Time period} \\
\text{CR} & = \text{Current ratio} \\
\text{QR} & = \text{Quick ratio} \\
\text{ITR} & = \text{Inventory turnover ratio} \\
\text{DTR} & = \text{Debtors turnover ratio} \\
\text{WCTR} & = \text{Working capital turnover ratio} \\
\text{CTR} & = \text{Cash turnover ratio}
\end{align*}
\]
The regression equation is as follows:

\[ VACE_t = a + b_1 CR_t + b_2 QR_t + b_3 ITR_t + b_4 DTR_t + b_5 WCTR_t + b_6 CTR_t + b_7 CATA_t + b_8 CAOI_t + b_9 CLI_t + b_{10} NLB_t + b_{11} GR_t + b_{12} Lev_t + b_{13} Size_t + e \]

where,

\[ VACE = \text{Value Added to Capital Employed} \]
\[ a = \text{Constant} \]
\[ b_1 \ldots b_{13} = \text{Regression coefficient} \]
\[ t = \text{Time period} \]
\[ CR = \text{Current Ratio} \]
\[ QR = \text{Quick Ratio} \]
\[ ITR = \text{Inventory Turnover Ratio} \]
\[ DTR = \text{Debtors Turnover Ratio} \]
\[ WCTR = \text{Working Capital Turnover Ratio} \]
iv. Stepwise Regression Analysis

To examine the variables that are prominently associated with profitability; and with VACE, stepwise regression analysis has been performed.

v. Path Analysis

In order to find out direct and indirect effect of the variables – included in Correlation and Multiple Regression Analysis – on Profitability and on VACE, Path Analysis has been carried out.

3.5 Definition of Terms

Few terms used in the study are defined here. The terms are (i) Size of hospitals, (ii) Value added to capital employed (VACE), (iii) Performance index of working capital
management. (iv) Utilisation index working capital management and (v) Efficiency index of working capital management.

i. Size of Hospitals

Size of a hospital refers to total assets. Natural log of assets is taken for measuring size.

ii. Value Added to Capital Employed

“Value added” is an alternative approach to measure the operational efficiency of a business. Value added may be known as the wealth created by the company from its operations.

iii. Performance Index of Working Capital Management

Performance Index of working capital indicates the average performance of different components of current assets.

iv. Utilization Index of Working Capital Management

Utilization Index indicates the ability of a hospital in utilizing current assets for generating operating income.

v. Efficiency Index of Working Capital Management

This index indicates the ultimate efficiency in working capital management. It has been computed by multiplying the over all Performance Index by Utilization Index.

The method of calculation of VACE, performance index, utilization index and efficiency index are explained in Chapter VI

The trends in working capital of Indian corporate hospitals are focused in the next chapter.