ABSTRACT

Sampling theory has a strong position due to its wider applicability in almost every branch of science. Sampling theory is involved with the collection, analysis and interpretation of data gathered from random samples of a population under study. The application of sampling theory is concerned not only with the proper selection of observations from the population that will constitute the random sample; it also involves the use of probability theory, along with prior knowledge about the population parameters to analyze the data from random sample and develop conclusions from the analysis. The normal distribution, along with related probability distributions, is most heavily utilized in developing the theoretical background for sampling theory.

In most of the literature, sampling deals with the development of estimates with less sampling error. A sampling method, if it is to provide a sample representative of the population, including that of variability among units of the population, are reflected in the sample as closely as the size of the sample will permit, so the reliable estimates of the population characters can be formed from the sample.

The details of the work presented in the thesis are as follows:

The present study discusses the problem of estimating population parameter by utilizing the suitable auxiliary information at estimation stage which is readily available at estimation stage. Some estimators are proposed and their properties are studied theoretically and empirically. The details of the research work presented in the thesis are as follows:

The work in the thesis has been arranged in five chapters. Chapter one is introduction and extensive review of literatures related to six important problems
discussed in this thesis. Chronological developments in these areas with their motivational factors have been discussed. This chapter provides a consolidated source of literature to the researchers who intend to work further in the areas of present studies.

Chapter two deals with the problem of estimating the population mean in circular systematic sampling using information on an auxiliary variable under single and double phase sampling scheme. A family of exponential estimators in circular systematic sampling design under single and two phase sampling have been suggested and their properties are studied. The expressions of mean squared error (MSE) up to the first order of approximation are derived. An empirical study is carried out to judge the best estimator out of the suggested estimators.

Chapter three discusses the problem of mean estimation when the auxiliary information is in the form of attribute. This chapter is divided into two parts. First part of chapter deals with the problem of estimating the finite population mean using auxiliary attribute in stratified random sampling. In this part taking the advantage of point biserial correlation between the study variable and auxiliary attribute, we have improved the estimation of population mean in stratified random sampling. The expressions for bias and mean square error have been derived under stratified random sampling. In addition, an empirical study has been carried out to examine the merits of the proposed estimator over the existing estimators. In the second part of the chapter, we address the problem of estimating the finite population mean when information on two auxiliary attributes are available. Three improved estimators in simple random sampling without replacement have been suggested and their properties are studied. The expressions of mean square error (MSE) up to the first
order of approximation are derived. An empirical study is carried out to judge the best estimator out of the suggested estimators.

Chapter four is divided into two parts. In the first part, we have proposed some generalized classes of modified ratio, regression-cum-ratio and exponential ratio type estimators for finite population mean of the study variable utilizing the information on two auxiliary variables in stratified random sampling. The expressions for bias and mean square error of proposed class of estimators have been derived and compared with those of existing estimators. An empirical study is carried out to demonstrate the efficiency of the proposed class of estimators over others and it is found that the empirical results support the theoretical study. In the second part, we have proposed some ratio-cum-product type estimators for population mean of the study variable y in the presence of non-response using auxiliary information under double sampling. The expressions of mean squared error (MSE) of the proposed estimators are derived under double (two-stage) sampling. In addition, an empirical study is carried out to show the properties of the proposed estimators.

In Chapter five, the discussion has been made about some imputation techniques for estimating the population mean when the data values are missing completely at random (MCAR) under SRSWOR scheme. Two classes of point estimators are proposed. The bias and mean squared error (MSE) expressions of the proposed point estimators are derived up to first order of approximation. It has been shown that the proposed point estimators are more efficient than some existing point estimators, due to Lee et al. (1994) and Singh and Horn (2000). In addition theoretical findings are supported by an empirical study based on two populations to show the superiority of the constructed estimators and methods of imputation over others.