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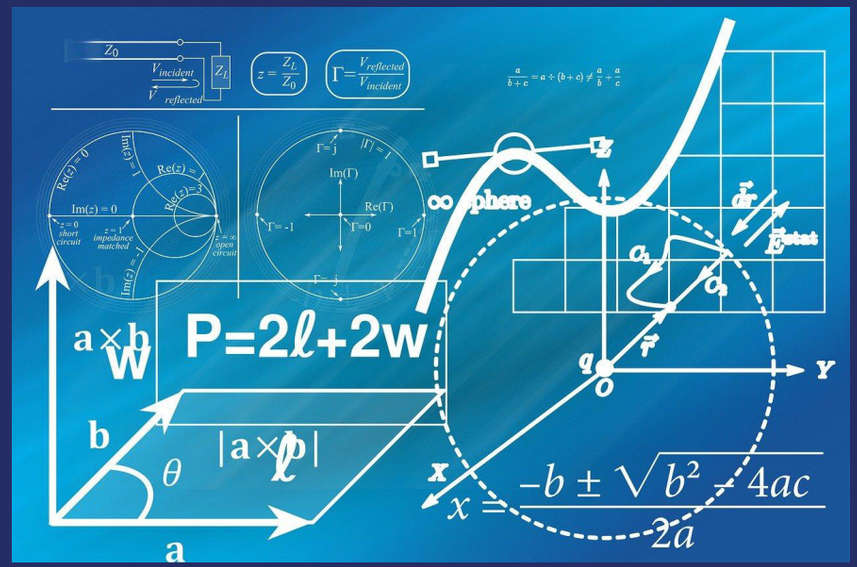
Dr. K. L. Bondar, Dr. A. P. Gingine, Dr. G. C. Done



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Genesis
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Chapter 1
Introduction

India has a long history of teaching and learning mathematics dating back to the Vedic age (1500 to 200 BC). Mathematics is embedded deeply into the life and culture of people in the Indian subcontinent attested by a long history of engagement with mathematics in art, craft, work and abstract disciplines of thought. From the period, 200-400 AD, enormous number of works on astronomy and mathematics were done mainly based on primitive knowledge. During the period 400- 1200 AD, a new branch of the subject known as "Ganita" came into existence with three different components namely, algebra, arithmetic and geometry. But, it was only in the 12th century that mathematics received prominence as a separate subject, as referred to in the publication "Lilawati" (1150 A.D.) by Bhaskaracharya. In the development of Indian culture, a significant role has been played by mathematics for a millennia. In the Indian subcontinent mathematical ideas that emerged have had a overwhelming impact on the world. After independence greater stress has been layed on mathematics teaching and learning compared to earlier periods in the history because mathematics as a subject is very useful for higher learning and no other subject can be a substitute for mathematics. It is a skill-subject and a subject of analysis of truth, hence, proficiency in mathematics is essential to all. But today, mathematics has not remained merely subject of study, it has become a language for communication and thought process. It is only through this language that man apprehends nature. Every stage in it is justified. It is a language of human life, and certainly, no more marvelous language was ever created by the mind of man. Mathematical language cuts short the lengthy

statements through its symbols. It is free from verbosity. It helps the expression of ideas in an exact form. It enables us to understand and appreciate precision, brevity, sharpness, logic and beauty of mathematics. Mathematics has played a decisive role in building up our civilization and therefore, it has become essential for the existence and progress of modern world. In today's world we have to be exact in our expression and so we make larger use of quantitative methods. Mathematics has not only been useful in its own right but it has also enriched this world by helping in development of other fields of knowledge. According to Berthelot (1897) mathematics is an indispensable instrument of all physical research. It is the foundation of the present explosion in scientific knowledge. This knowledge has brought about a tremendous industrial and technological revolution, which has not only affected the mode of living of man, but also his thinking and culture. The chief aim of mathematics is to arrive at a correct conclusion from a set of given conditions by making use of logical reasoning (Norma, 1983). Mathematics as a science, as an art, as a language and as an instrument is made inseparable part of education.

1.1 History of Mathematics

Mathematics is one of the corner stones of our civilization. The historical development of mathematics forms a fascinating story of man's efforts to acquire and develop various ideas for understanding the physical environment. (Bhimsamkaram C V, 1979).In an effort to arrange, standardize, and categorize his observations, experiences, and feelings in an effort to unravel the mysteries of existence and explain natural relationships, man has always wanted to explore the world around him. The desire for humans to study, measure, and grasp things led

to the birth of mathematics. Through mathematical activities, the knowledge and abilities that are required for these reasons grow.

Mathematics starts with counting. It is not reasonable, however, to suggest that early counting was really mathematics as we understand today. Only when some record of the counting was kept and, therefore, some representation of numbers occurred did mathematics emerge as a subject. A few symbols cemented by a set of rules were the foundation on which the edifice of classical mathematics was erected. It created an idealization of 3-dimensional space called 'Euclidean Geometry' and systems of counting and measuring for the business world.

Mathematics as a distinct learning field grew in various civilizations. It has its roots in ancient Egypt and Babylonia. The Babylonian basis of mathematics was inherited by the Greeks and independent development by the Greeks began from around 450 BC. After this, progress continued in Islamic countries. Mathematics flourished in particular in Iran, Syria and India. Later some of this mathematics was translated into Latin and became the mathematics of the West. The diverse discoveries and applicability of mathematics saw the rapid emergence and progress of mathematics as subject in different parts of the world. Modern mathematics can be said to have been born in the 1800s and is characterized by comprehensive and systematic synthesis of mathematical knowledge. Further changes have transformed mathematics to what it is today. Social and Behavioral sciences were the major stimulants for the development of new mathematics. The period since the end of World War II has been the golden age of mathematics. Owing to heavy applications in business, management, biology, medicine, economics, psychology. Government affairs etc the term mathematics is nowadays replaced by the more inclusive term mathematical sciences which includes mathematics in its pure and applied form (Collier's Encyclopedia)

1.2 Importance of Mathematics in Daily Life.

When we talk about daily life, we cannot deny the fact that basic learning skills, reading, writing, arithmetic and life skills, are necessary for people to survive as well as to improve quality of life and mathematics education is intended to develop these skills. The importance of mathematics transcends all definitions and you may have run away from mathematics in school very much, but in daily life, it chases you like a monster. No matter how hard you try, it is impossible to escape it

"If people do not believe that mathematics is simple, it is only because they do not realize how complicated life is." ***- John Von Neuman***

When we wake up in the morning, we start our day by using mathematics unconscientiously, like we thank the almighty if we get 10 minutes extra sleep. If there would have been no clocks or watches in the world, some words would have lost their existence forever and one of them is the word 'discipline'. We use mathematics and do calculations when we pay our bills, when we cook our food, when we go to office, when we refuel our cars and bikes, when we wait for the weekdays to get over, when we get our salaries, when we watch sports matches, and most importantly, for information technology. When we plan to go out for dinner, choose a shampoo, or plan a holiday all have one thing in common i.e. Mathematics. Mathematics is all around us because planning a holiday is all about optimization. Deciding which place we should visit? Deciding the best time to go? Reaching the airport on time, how to fit all the stuff in the suitcase? Answering all such questions involves use of mathematics. Basic mathematics is required in calculating Hotel prices, flight timetables, suitcase volumes etc. converting currencies from rupees to dollars and others, cutting fruits and vegetables involves use of fractions, we have to be very accurate while cutting a tomato in quarters, an

apple into six or a banana into nine. A pomegranate might have 200 seeds, and each would be a 200th of the whole. Astronomical calculations are involved in knowing which date it is and which date will be next week since it is all multiples of 7.

Bargaining with the shopkeeper is every lady's favorite task so that he may give her discount, knowledge of temperature is required in knowing that we have fever or not, blood pressure is determined by our heart palpitations, we have to keep in mind the speed of the car while driving or volume tells us the amount of water to pour into our glass, ratios tell us the size of the things which one is bigger than the other, knowing if we lose weight by doing some simple arithmetic, weather forecast is done by using mathematics, knowing if we can or can't lift something because of the ratio between the amount force that our body can execute and the amount of force needed to lift that thing. When we decorate our homes, when we sail a boat off the coast or when we build a house, buy a car, follow a recipe, our brain deals with mathematics to get things done.

The language of math is numbers, and if we are well versed in this language of numbers, we can make important decisions and perform everyday tasks which math helps us to do like shopping, buying the right insurance, building a home within a budget, understanding population growth, or even bet on the horse with the best chance of winning the race. When we make decisions about buying or leasing a new car and predicting how much money you can save for your retirement, we use an interest calculator and all this requires mathematics.

Mathematical knowledge is required by many of our daily jobs to be done effectively. For example, if a person wants to decorate a house, he needs to know the number of materials required. The required amount of material will be purchased only when one is aware of the measurement, space and shape of the area

he is working on. This helps in ensuring that you do not run out of essential materials before the job is finished or you do not have too much left over.

It is advisable for everyone to learn basic mathematic skills because Jobs which do not use mathematics every day still require some basic knowledge of mathematics. Mathematical knowledge is essentially required in several fields like architecture or engineering, and for most jobs like building and construction, scientist, plumber, electrician, accountant and even rally drivers. It is hard to believe that even sports also rely on mathematics in which only managers and players, but also supporters ought to have some basic mathematics knowledge. The mathematics concept can apply when one wants to comment about the game, the player's analysis and much more. Referees and coaches make calls which are based on time, statistics and percentage – all the past game played and players, their failure and success rates can only be worked out using some aspects of mathematics. Graeber and Weisman (1995) agree that mathematics helps the individual to understand his/her environment and to give accurate account of the physical phenomenon around him/her. Mathematics exhibits the power to think consistently and logically. It helps in our quest for knowledge, truth and beauty, desire to interpret and control our environment. Our culture is on the move through mathematician. As a member of the modern society, we all should have mathematical thinking as a habit of mind for its use in the workplace, business and finance; and for personal decision-making.

1.3 Mathematics as Science.

Carl Gauss, the king of Mathematicians, referred to mathematics in Gauss zum Gedachtniss (1856) as "*The Queen of all Sciences*", the word corresponding to science means a "field of knowledge", and this was the original meaning of "science" in English, also; mathematics is in this sense a field

of knowledge and certainly a science in the broad sense of "systematic and formulated knowledge", However, the majority of people restrict the term "science" to the natural sciences. Mathematics gives natural science the language it needs to describe the universe. Natural science uses this language to do so. Stories claim that the philosopher and mystic Pythagoras studied the relationship between mathematics and music during his time in ancient Greece. When a guitar string is plugged, the rays that vibrate are known as a frequency, and they are measured in Hertz, or the number of vibrations per second. Four aspects of the string—its thickness, density, length, and tension—affect the frequency. The frequency or pitch increases as the length of the string decreases. We have a one of examples of how mathematics and various arts interact. This is just one from the world of music. Engineers can now place a rover the size of a car across Mars, and we can connect wirelessly over a massive global network. However, beneath all these contemporary marvels lies something profound, enigmatic, and strong. It has been referred to as the universe's language and as the pinnacle of its civilization. Mathematics is the name of it. But where did math come from and why does it function so effectively in science?No apparent upper limit exists for numerical skills. The application of mathematics in our physical environment is pervasive; it is all around us. Humans have always observed nature and looked for patterns, as we do when we gaze at the stars and identify constellations. We even think they might be in charge of our future. We observe the seasons as they change as the days turn into darkness before turning back into day. The human body and tiger stripes both have symmetrical patterns that we may perceive in biology and incorporate into our artistic creations. Why a sea shell's spiral shape would resemble a spiral galaxy. Scientists frequently use mathematics, a potent instrument, to try to explain the patterns in our world.In order to find the underlying causes of nature's rhythm and regularities, they quantify their

observations and use mathematical analysis to examine them. They are interested in learning the mysteries underlying everything from the elliptical orbits of the planets to the electromagnetic waves that connect our cell phones. How does it function is a pertinent question. Is reality fundamentally mathematical in nature? or is math's purely mental?

Nature is surrounded by numbers, and when we look at these numbers, we may see everything from the stock market to human beauty, which fascinates everyone. It is puzzling how these numbers appear to be preferred by evolution. There is a strong link between the physical world and mathematics. We are all familiar with the geometrical number pie. Pie explains which color should show up in a rainbow and how luminous a supernova should be. According to mathematics, our physical reality resembles a digital photograph in that it initially appears to be a flower, but as we get closer, we realise that it is actually a field of pixels, each of which is represented by three integers that indicate how much red, green, and blue it contains. The hidden laws of our world can be uncovered and discovered through mathematics. The language of mathematics is the language of the cosmos. Albert Einstein questioned how it was possible that mathematics explains the cosmos as we know it so well.

In 1920 in a lecture on geometry and experience Albert Einstein stated that *"as far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality"*.

According to Setidisho (2001), mathematics is the only topic that acts as a powerful unifying factor among many disciplines of inquiry, and without it, knowledge of the sciences is frequently only superficial. The reality that we see is shaped by mathematics, which exists in its own universe. It is a

complex synthesis of discoveries and creations. What's left is ultimately a big mathematics conundrum.

1.4 Importance of Mathematics in Higher Education

Mathematics plays a vital role to develop future of students who want to excel in the areas like Business, Marketing, Finance, Commerce, Biology, Economics, Chemistry, Computer Science, Physics, Environmental Engineering, Forestry, Psychology, Nursing, Health and Human Sciences. There are unique applications to every branch of mathematics to the different career options. For example, algebra is very important for computer science, cryptology, networking, study of symmetry in chemistry and physics. Calculus (including differential equations) is used in chemistry, biology, physics, engineering, the motion of water (hydrodynamics), rocket science, molecular structure, option price modelling in Business and economics models, etc. Mathematics has also made its place in social sciences like psychology and education. Earlier it was thought that mathematics is only required in higher education in sciences only but now it has been realized that no single subject or discipline exists which does not require mathematical knowledge. Even if one wants to become a teacher of other subjects or a principal mathematics plays a very important role. Mathematics has found its place in social sciences also and the evidence for this can be given by a step of NCF-2009. To equip principals and school administrators with training and knowledge in mathematics NCF (national curriculum framework for teacher education) 2009 has suggested to offer specialized M.Ed. programs in mathematics education and science education. Numerous examples showing the place of mathematics in higher education has already been discussed in the previous section by the researcher.

1.5 Importance of Mathematics for Competitive Exams.

Most of the students do not take mathematics seriously in High School or they ignore its importance and face serious consequences by forfeiting many future career opportunities that they could have. For example, degrees in the following areas require good knowledge of mathematics and statistics: Physical sciences (Chemistry, Physics, Engineering), Life and health sciences (Biology, Psychology, Pharmacy, Nursing, Optometry), Social sciences (Anthropology, Communications, Economics, Linguistics, Education, Geography), Technical sciences (Computer Science, Networking, Software development), Business and Commerce, Actuarial science (used by insurance companies), Medicine, Union Public Service Commission etc.

In 2014 the UPSC exam in India has gone through agitations and the argument was that the pattern of the second compulsory exam paper (CSAT-II) puts students from Hindi medium and non-mathematical background at a disadvantage with the inclusion of questions on quantitative analysis, logical reasoning etc. This problem leads to a solution that if mathematics is taught as a compulsory subject up to graduation level, such problems would not arise. Moreover, it would be wise enough for students to enter university with a good background in mathematics. So it is recommended that well in university mathematics so that it may be in the student's best interest.

Mathematics plays a very important role in highly competitive job market. One may not be studying to become accountant or engineer but still the skills which are developed by learning mathematics will be applied in all walks of life. Mathematical knowledge is required in many entry-level jobs. If students do not do well in mathematics, they may face serious problems in the career world where there is lot of competition because without

mathematics many careers are pointless. Therefore, if students want to go into any of the physical, social, health sciences, business, medicine, or related areas they are exhorted to take mathematics. The PISA (Program for international student assessment) 2012 survey revealed that if students have poor mathematics skills, they severely limit their access to better paying jobs. The survey on the other hand shows that the students who have strong skills in mathematics are also more likely to volunteer themselves in different activities. Thus, utmost importance should be given to mathematics when we want to excel in any career.

1.6 Principles of Learning Mathematics

The process of learning mathematics involves a number of activities and approaches, including reading, listening, asking questions, working with real-world objects, writing, sketching, comparing, interpreting, analysing, and computing. A fundamental human undertaking, mathematics enables people to describe, evaluate, and comprehend their surroundings. The ability to think clearly and follow assumptions to logical conclusions are prerequisites for learning mathematics.It develops skills like ability to handle abstractions, and an approach to problem solving. Dienes (1960) proposed a theory of mathematics learning consisting of four principles namely:

- The dynamic principle.
- The constructive principle.
- The mathematical variability principle and
- The perceptual variability principle

Although these guidelines are simple, it is the people who communicate mathematical concepts—not the recipients—who need to be aware of them.

Although they are rather straightforward on their own, their mathematical applications require a lot of careful thought.

1.7 Need of Learning Mathematics

The legendary philosopher Plato emphasised the study of mathematics in the seventh book of his masterpiece, The Republic. Famous scientist and engineer A.P.J. Abdul Kalam, who served as India's 11th president from 2002 to 2007, insisted that science and mathematics have practical applications. Our current civilization is built on mathematics and science, so as long as our generation continues to priorities these fields, the entire globe will profit. Barack Obama, the president of the United States, has also started a campaign called "Educate to Innovate" to encourage American children to engage with and excel in science, technology, engineering, and mathematics (STEM). Leading businesses, foundations, science and engineering societies, as well as the federal government, have all contributed to this campaign by working with young people across America to achieve academic success in science and mathematics.

The Education Commission in India (from 1966 to 1968) noted that "one of the outstanding features of scientific culture is quantification," and that "mathematics has always played a very important role in quantifying ideas and solving everyday life problems, and has been considered to be a compulsory component of school education." The commission advocated for making mathematics a required subject up through the high school level for all pupils. The panel might have been swayed by world opinion at the time and supported "new mathematics," which later permeated all of secondary school. The Commission also placed more emphasis on fundamental concepts being understood than on the mechanical instruction of mathematical operations in mathematics teaching and learning. Commenting on the educational climate at the time, it was noted that

instruction in the typical school continued to follow a mechanical pattern, continued to be dominated by the verbalization of old ills, and as a result, remained as monotonous and uninspired as before. The National Policy on Education (1986), which recognised the value of mathematics in general education, also recommended that mathematics be viewed as a tool for teaching children to reason, analyse, and express themselves logically. The primary objective of mathematics education, according to the National Curriculum Framework released by the NCERT in 2005, is to "improve children's ability for mathematization". Developing "useful" skills, particularly those linked to numeracy—numbers, number operations, measurements, decimals, and percentages—is one of the narrow goals of school mathematics. The child's capacity to think and reason quantitatively, to follow presumptions to their logical conclusion, and to deal with abstraction should all be developed, if we consider the greater goal. It involves a method of operation as well as the aptitude and outlook for posing and resolving issues.

1.8 Background of The Study

Mathematics is the oldest discipline among all sciences that have developed through the ages having a direct impact on the quality of human life on the world. Mathematics education is a vital tool for the understanding and application of science and technology. It plays the important role as a predictor of much needed technological developments in a nation. Like the other developing nations India realized the significant role of Mathematics towards the nation building and therefore made the subject compulsory up to secondary level.

At various times, people have believed the following differences as based on inborn characteristics.

- Women are less intelligent than men.
- Women are less capable (because of general, physical fragility), of studying at high intellectual levels.
- Men are good at mathematics and physical sciences, women at languages and verbal performances.
- Objective intelligent testing does not support that female are less intelligent.

Currently there is a big movement in India to try to address the issues of gender equity. Affective action in favor of women is now being practiced in both the private and public sector as well as in educational institutions. In spite of efforts to afford both female and male students, equal opportunity in education, it has been alleged that this is not being extended to or achieved in practice for all the subjects in the curriculum and to mathematics in particular.

The issue of sex differences in Mathematical problem solving has been raised often, especially in the popular press. For example, in 1980, Newsweek run a story entitled, “Do males have a mathematics gene? And the same week, Time devoted a page to “The gender factor in Mathematics”. Inspite of the occasionally intense public attention and strong opinions sometimes given in popular publications, it is possible to examine sex differences issue from a scientific point of view. In particular, three related questions can be raised:

1. Are there sex differences in student’s scores on test of Mathematical ability and achievement?

2. Are there Residence differences in student's scores on test of Mathematical ability and achievement?
3. If so, why are the differences?

Objectives of the Study:

- To find out the gender differences of post graduate students in mathematical ability in cognitive, affective and psychomotor outcomes.
- To find out the residence (Native Place Area)differences of post graduate students in mathematical ability in cognitive, affective and psychomotor outcomes.
- To find the factors that lead to gender differences in mathematical ability.
- To verify whether parental socio-economic status are significant factors in the students' Mathematics achievement and abilities.
- To study the achievements of the post graduate mathematics students studying in the departments of colleges/University in the Swami Ramanand Teerth University Nanded region.

Hypothesis of the Study:

The following null hypotheses are hereby stated:

H1: There is no significant difference between the mathematics achievement and mathematical abilities of male and female students in post graduate mathematics departments under Swami Ramanand Teerth Marathwada University, Nanded.

H2:There is no significant difference between the mathematics achievement and mathematical abilities of rural and urban students in post graduates'

mathematics departments under Swami Ramanand Teerth Marathwada University, Nanded.

H3: The parental socio-economic status is not a significant factor in Mathematics achievement and mathematical abilities of male and female students in post graduate mathematics departments under Swami Ramanand Teerth Marathwada University, Nanded.

1.9 Research Population

In this research we choose the post graduate students (2019-20) in campus and affiliated colleges of S. R. T. M. University, Nanded as population. In this university region School of Mathematical Sciences, S. R. T. M. University and Science College, Nanded have a granted post-graduation course and D. S. M. Arts, Commerce and Science college, Parbhani, Mahatma Basaweshwar College, Latur, Dayanand College, Latur, Shahu College, Nanded, SanjivaniMahavidyalay, Chapoli and Shri Shivaji College, Parbhani have a non-granted post graduate course. In the academic year 2019-20 near about 500 students are studying in this university region.

1.10 Sample

In this research we took sample size of this study is 400 students. All students are studying in the campus as well as affiliated colleges in Swami Ramanand Teerth Marathwada University, Nanded, India.

Chapter 2
Methodology

The heart of any research is design. This chapter discusses research samples, their procedures, the variables employed in the study, the sources, and the results. Methods of data collection, instruments utilized for data collection, the dependability of the tools chosen or built, and the statistical processes employed in the analysis are all detailed.

2.1. Survey Research Method

A survey method is a procedure, instrument, or technique you might use to interview a predetermined group of individuals in order to collect data for your project. Typically, it makes it easier for participants in the research to communicate with the individual or group conducting the study.

Depending on the sort of study you're conducting and the kind of data you ultimately want to collect, survey methodologies might be either qualitative or quantitative. For instance, you may use Form plus to design and manage an online survey that lets you gather statistical data from respondents. You can set up a focus group or perform an in-person interview for qualitative research.

2.2. Steps of Survey Research

1. Define the population and sample

Before beginning a survey research project, we should already have a specific study question that outlines our objectives. We need to decide precisely who we want to participate in the survey based on the answer to this question.

Population

The particular group of people you wish to learn more about is known as the target population. This category may be extremely broad or quite small. For instance:

- The population of India
- University students
- Second-generation immigrants in the Netherlands
- Customers of a specific company aged 18-24
- Indian transgender women over the age of 40

The goal of your survey should be to provide findings that can be applied to the entire population. That implies that you must be very specific about whom you wish to make conclusions.

If your survey cannot be generalised, a number of classic research biases, including sample bias and selection bias, might develop. These biases have significant negative effects on the reliability of your findings.

Sample

It is quite difficult to poll the complete population of your study; for example, it would be incredibly challenging to gather responses from every Brazilian or American college student. Instead, a sample of the population will typically be surveyed.

The population's size will determine the sample size. To determine how many replies are required, utilise an online sample calculator.

There are several sampling techniques that enable generalisation to large populations. The sample should, however, generally strive to be a representative sample of the population. Your sample's size and representativeness will determine how reliable your findings are. As you create your sample, be mindful of many forms of sampling bias, especially self-selection bias, nonresponse bias, under coverage bias, and survivorship prejudice.

2. Decide the type of survey (mail, online, or in-person)

Two primary categories of survey exist:

Questionnaire- a survey, in which a set of questions is sent out through mail, email, or in person, and respondents themselves fill it out.

Interview-a conversation where the researcher records the replies after posing a series of questions over the phone or in person.

Depending on the research's main objectives, sample size, and geographic location, you must decide which kind to use.

3. Design the survey questions and layout

We need to decide which questions we will ask and how will ask them. It's important to consider:

- The type of questions
- The content of the questions
- The phrasing of the questions
- The ordering and layout of the survey

i) The type of questions

There are two main forms of survey questions: open-ended and closed-ended. Many surveys use a combination of both.

Closed-ended questions give the respondent a predetermined set of answers to choose from. A closed-ended question can include binary question, scale, list of option with single answer possibilities and list of option with multiple answer possibilities. The ideal questions for quantitative research are closed-ended ones. You can use the numerical data they give you to statistically analyse and look for trends, patterns, and correlations.

The greatest questions for qualitative research are open-ended ones. There are no predetermined options for solutions to this kind of query. The respondent instead provides an answer in their own words. Although they can be used in questionnaires, open questions are most frequently used in interviews. They are frequently helpful as follow-up inquiries to request additional in-depth justifications for the answers to the closed questions.

ii) The content of the survey questions

We must carefully evaluate each question in the survey in order to guarantee the legitimacy and dependability of your results. All queries must be specifically

targeted and provide sufficient context for the respondent to provide accurate responses. Questions that are not directly related to the survey's objectives should be avoided.

Make sure that all possibilities are covered when creating closed-ended questions. If you include a list of options that isn't exhaustive, you can add another field.

iii) Phrasing the survey questions

The survey questions should use language that is as exact and straightforward as feasible. Consider your target audience's level of subject understanding as you tailor the questions. Keep your language free of industry-specific jargon.

Survey questions are at risk for biases like social desirability bias, the Hawthorne effect, or demand characteristics. It's critical to use language that respondents will easily understand, and avoid words with vague or ambiguous meanings. Make sure your questions are phrased neutrally, with no indication that you'd prefer a particular answer or emotion.

iv) Ordering the survey questions

Logic should be used to arrange the questions. Start by asking simple, unimportant, closed-ended questions to entice the respondent to continue.Group questions that are similar if the survey covers multiple distinct subjects or themes. To make it easier for respondents to comprehend the questions being asked in each area, you might break a questionnaire into sections.A question should be placed next to another question if it refers to or depends on the response to a prior question.

4. Distribute the survey and collect responses

Make a detailed strategy for the survey's timing, location, method, and participants before we get started. Plan ahead by deciding how many responses we need and how we will access the sample.We can conduct the survey using our method of choice, whether it be by mail, online, or in person, after we are confident that we have developed a solid research design that is appropriate for answering our research questions.

5. Analyse the responses

There are numerous ways to analyse the survey results. In order to sort all the responses, we must first process the data, typically with the use of a computer programme. By eliminating responses that were given inaccurately or incompletely, we should also clean the data.

If we used open-ended questions, we will need to code the answers by giving each one a label and classifying them according to themes or categories. Additionally, we can employ more qualitative techniques like thematic analysis, which is particularly effective when used to analyse interview data.

Statistical analysis is typically carried out with the use of software like SPSS or Stata. The same survey data collection may be the topic of several analyses.

6. Write up the results

When all the relevant information has been gathered and examined, we finally put it all down as part of our thesis, dissertation, or research paper.

We detail every step of the survey's methodology in the section. Explain the types of questions we asked, the sample strategy, the time and location of the survey, as well as the response rate. The entire questionnaire can be attached as an appendix, and if necessary, we can make references to it in the text.

The analysis will next be introduced by detailing the data's preparation and the statistical techniques we employed to analyse it. we enumerate the most significant findings from our investigation in the results section.

We respond to our research question, explain and interpret these findings, and consider the implications and constraints of the study in the discussion and conclusion.

Types of Survey Method

1) Online Survey Method
2) Face-to-Face Surveys
3) Focus Groups
4) Panel Sampling

5) Phone Survey
6) Mail Surveys
7) Kiosk Surveys
8) Paper Surveys

2.3. Methods of Data Collection:

Primary Data collection was done through the questionnaire method from the respondents. The questionnaire was given to the students through online platform via google forms and they were asked to fill them up. Necessary help was rendered whenever they found it difficult to answer. Sample size of this study is 400 students. All students are studying in the campus as well as affiliated colleges in Swami Ramanand Teerth Marathwada University, Nanded, India.

2.4. Data Analysis & Interpretation:

Researcher collected primary data through structured questionnaire. The data was then entered manually in IBM SPSS (Statistical Package for Social Science) Version 22 and then rechecked for any missing values, duplications or errors followed by further processing and testing of hypothesis by applying appropriate statistical tests.

2.5 Statistical Techniques

Mathematical Ability (Test Score) was considered as primary outcome variable. Participation in Mathematics Related Activities and Prize/rank in Mathematics Related Activities were considered as Secondary outcome variables. Gender, Residence (Native Place Area), cast category and name of university were considered as primary explanatory variables.

Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency, and proportion for categorical variables. Non normally distributed quantitative variables were summarized by median and interquartile range (IQR). Data was also represented using appropriate diagrams like bar diagram, pie diagram and box plots.

All Quantitative variables were checked for normal distribution within each category of explanatory variable by using visual inspection of histograms and normality Q-Q plots. Shapiro- wilk test was also conducted to assess normal distribution. Shapiro wilk test p value of >0.05 was considered as normal distribution.

For normally distributed Quantitative parameters the mean values were compared between study groups using ANOVA (>2 groups). If statistically significant difference was found in ANOVA, appropriate post-hoc test (LSD) was used to assess statistical significance of pair wise comparisons.

Categorical outcomes were compared between study groups using Chi square test /Fisher's Exact test (If the overall sample size was < 20 or if the expected number in any one of the cells is < 5, Fisher's exact test was used.)

P value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.

2.6. Research Population

In this research we choose the post graduate students (2019-20) in campus and affiliated colleges of S. R. T. M. University, Nanded as population. In this university region School of Mathematical Sciences, S. R. T. M. University and Science College, Nanded have a granted post-graduation course and D. S. M. Arts, Commerce and Science college, Parbhani, Mahatma Basaweshwar College, Latur,

Dayanand College, Latur, Shahu College, Nanded, SanjivaniMahavidyalay, Chapoli and Shri Shivaji College, Parbhani have a non-granted post graduate course. In the academic year 2019-20 near about 500 students are studying in this university region.

Research Sample

A research study seeks to learn more about the characteristics of one or more groups. It is not always necessary, and in some cases impossible, to investigate the whole population in a single study. Essentially, research is the act of generating conclusions about a big aggregate of subjects of a certain kind based on the examination of a small sample of that aggregate or population.In contrast to sampling, which is the art of choosing how many elements from a population should be chosen in order to ensure that it accurately represents the entire population, sampling refers to the method of choosing a small portion or specimen from a large universe of subjects in order to study some quality or characteristic of the entire population. Statistics refers to the numerical numbers that are based on a representative sample. According to statistics, matching population values, or "parameters," can be estimated. Therefore, a statistical investigation is estimating an unknown value using "statistics" gleaned from a sample. This method is referred to as statistical inference (Best p. 198).

A good sample has two major characteristics:

1) It should be sufficiently large in size.

2) It should be representative of the population.

An investigator can draw meaningful inferences and make generalizations about the population from which the sample is derived with the aid of a sufficient sample size and technique of sample selection from the population of interest.

In this research we took sample size of this study is 400 students 264 girls and 136 boys belonging to post graduate level course. All students are studying in the campus as well as affiliated colleges in Swami Ramanand Teerth Marathwada University, Nanded, India.

Sample Description:

This of the analysis contains general information about the students and helps to understand the demographics of the students who took the survey. The questions aim to find out students Gender, Residence and Castes who admitted in post-graduation course in mathematics and participation and achievement in mathematics related activities.

Table No. 2.1: Demographic analysis

Sr. No	Factor	Option	No. of Students	Percentage
1	**Gender**	**Male**	136	34.00
		Female	264	66.00
2	**Residence**	**Rural**	292	73.00
		Urban	108	27.00
3	**Caste**	**Open**	140	35.00 **(25)**
		SEBC	73	18.25 **(13)**
		EWS	9	2.25 **(10)**
		SC	37	9.25 **(13)**
		ST	8	2.00 **(7)**
		VJNT	43	10.75 **(11)**
		OBC	83	20.75 **(19)**
		SBC	7	1.75 **(2)**

4	**Graduation Completed University**	**Home University**	342	85.50 **(70)**
		Other University in State	51	12.75 **(28)**
		Other State /Other Country	7	1.75 **(2)**
5	**Participation in math's related activities**	**Yes**	237	59.25
		No	163	40.75
6	**Achievement in mathematics related activities.**	**Yes**	124	31.00
		NO	276	69.00
7	**Mathematical ability test**	**Fail**	57	14.25
		Pass	81	20.25
		Grade A	66	16.50
		Grade A+	196	49.00
8	**Family Income Status**	**Below 20000**	112	28
		20000-60000	177	44.25
		60000-120000	79	19.75
		Above 120000	32	8
9	**Parents occupation**	**Agriculture**	183	45.75
		Business	46	11.50
		Services	119	29.75
		Teaching	52	13

Research Tools

A personal google form was given to each sample which collected details of the sample on i) Gender, ii) Class, iii) College studying at, iv) Type of college v) locality vi) medium of instruction vii) birth order viii) monthly income, and ix) parents' occupation.

To measure the cognitive constructs,

1) An achievement in mathematics related activities
2) Ability test on concept of 5 basic papers in post graduate's syllabus

Operational Definitions of terms

Gender differences

In this study, gender differences refer to cognitive and affective differences that exist between the sexes. "The cognitive differences correspond to the 'cognitive constructs' of boys and girls, namely academic accomplishment, spatial visualization capacity, and logical reasoning ability.

The affective differences apply to the sexes' attitudes toward mathematics, values for mathematics, and attributional methods.

Thus, in this study, gender disparities do not suggest biological sex differences, but rather variations in intellectual skills.

Mathematical Ability

Mathematical ability can be characterized as the capacity to comprehend the nature of mathematical problems, their symbols, methods, and proofs in order to learn them, to retain them in memory, and to reproduce them. It is the capacity to solve various types of questions that are typically determined by many concepts of graduation and post-graduation level mathematics syllabus.

Post Graduates Mathematics students

Boys and girls who are enrolled in the regular M.Sc. F. Y. and M.Sc. S. Y. of the higher education are considered post graduate mathematics students for the purposes of this study.

Swami Ramanand Teerth Marathwada University, Nanded is the Maharashtra government University. This university covers the most of the rural area of mrathawada four district Nanded, Parbhani, Latur, Hingoli.

Chapter 3
Data Interpretation and Analysis

3.1 Sample Description

In this research we choose the post graduate students (2019-20) in campus and affiliated colleges of S. R. T. M. University, Nanded as population. In this university region School of Mathematical Sciences, S. R. T. M. University and Science College, Nanded have a granted post-graduation course and D. S. M. Arts, Commerce and Science college, Parbhani, Mahatma Basaweshwar College, Latur, Dayanand College, Latur, Shahu College, Nanded, SanjivaniMahavidyalay, Chapoli and Shri Shivaji College, Parbhani have a non-granted post graduate course. In the academic year 2019-20 near about 500 students are studying in this university region.

In this research we took sample size of this study is 400 students. All students are studying in the campus as well as affiliated colleges in Swami Ramanand Teerth Marathwada University, Nanded, India.Data of this experiment is collected by basic information questionaries and mathematical ability test using google forms.

Table 3.1.1: Descriptive analysis of gender in the study population (N=400)

Gender	Frequency	Percentages
Male	136	34.00%
Female	264	66.00%

Among the study population, 136 (34%) were participants male and remaining 264 (66%) participants were female. (Table 3.1.1 & Figure 3.1.1).we observe above table, we can see that the trend of admission to post-graduation in Mathematics is more of girls than boys. From total admission 66% of the girls have taken this course.

Figure 3.1.1: Pie chart of gender in the study population (N=400)

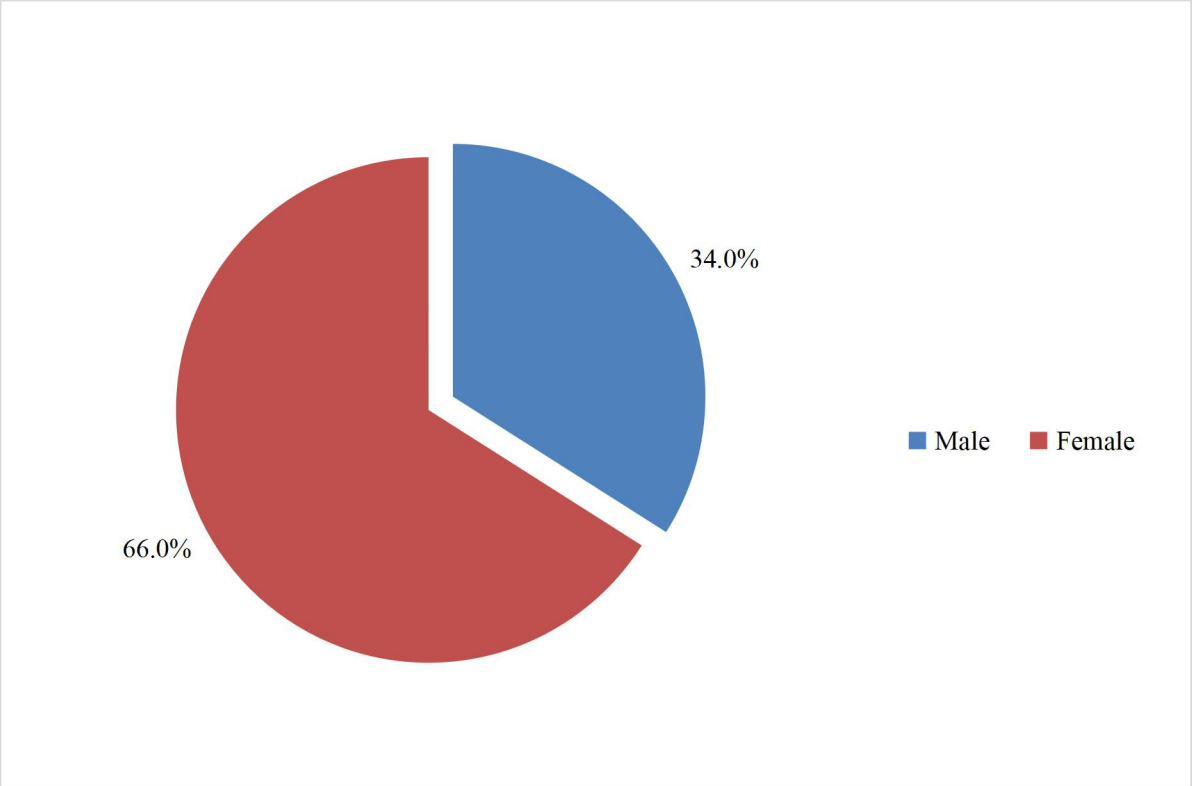


Table 3.1.2: Descriptive analysis of class (in academic year 2019-20) in the study population (N=400)

Class (In Academic Year 2019-20)	Frequency	Percentages
M. Sc. F. Y.	195	48.75%
M. Sc. S. Y.	205	51.25%

Among the study population, 195 (48.75%) were M.Sc First year students and remaining 205 (51.25%) participants were M.Sc Second year students. (Table 3.1.2& Figure 3.1.2).

Figure 3.1.2: Pie chart of class (in academic year 2019-20) in the study population (N=400)

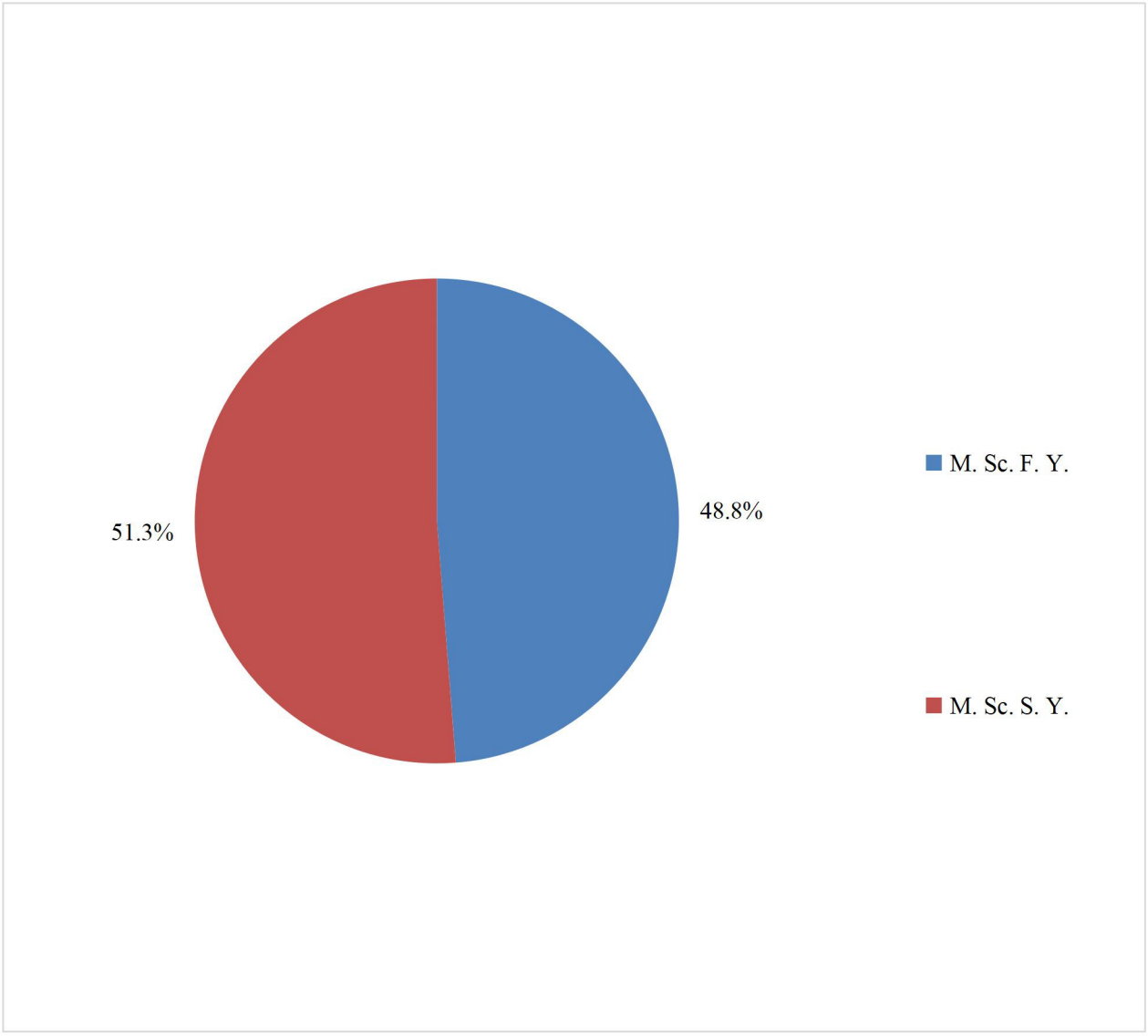


Table 3.1.3: Descriptive analysis of name of the college in the study population (N=400)

Name of The College	Frequency	Percentages
N.E. S. Science College, Nanded	154	38.50%
School of Mathematical Sciences, S.R.T.M.U. Nanded	84	21.00%
D. S. M. College, Parbhani	56	14.00%
Dayanand Science college, Latur	49	12.25%
Rajarshi Shahu College, Latur	36	9.00%
SanjeevaniMahavidyalaya, Chapoli	9	2.25%
Mahatma Basweshwar College, Latur	8	2.00%
Shri Shivaji college, Parbhani	4	1.00%

Among the study population, 154 (38.50%) students from N.E. S. Science College, Nanded, 84 (21%) students from School of Mathematical Sciences, S.R.T.M.U. Nanded, 56 (14%) students from D. S. M. College, Parbhani, 49 (12.25%) from Dayanand Science college, Latur, 36 (9%) from RajarshiShahu College, Latur, 9 (2.25%) from Sanjeevani Mahavidyalaya Chapoli, 8 (2%) from Mahatma Basweshwar College, Latur and 4 (1%) Shri Shivaji college, Parbhani (Table 4.1.3& Figure 4.1.3)

Figure 3.1.3: Bar chart of name of the college in the study population (N=400)

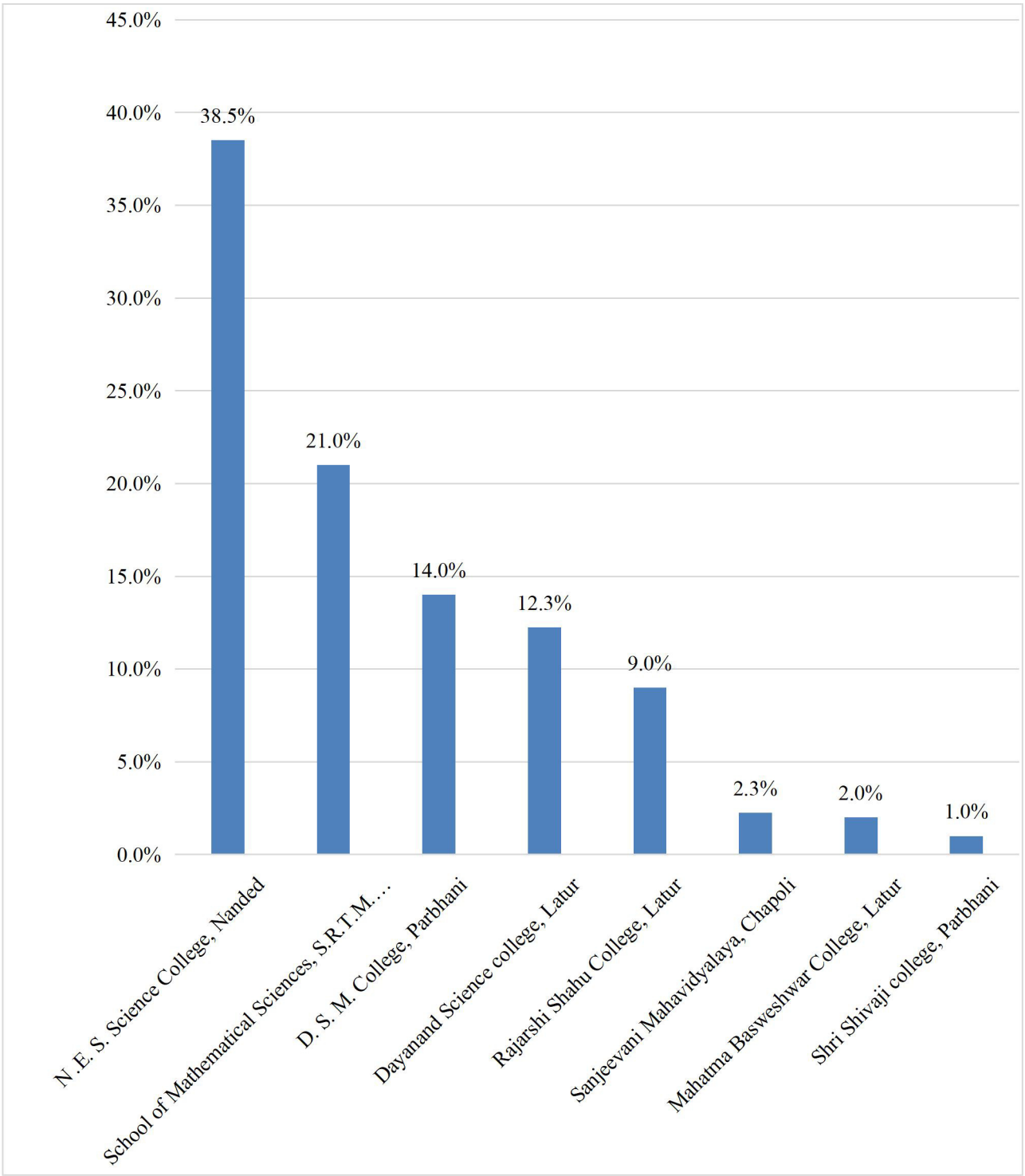


Table 3.1.4: Descriptive analysis of residence (native place area) in the study population (N=400)

Residence (Native Place Area)	Frequency	Percentages
Rural	292	73.00%
Urban	108	27.00%

Among the study population, 292(73%) participants who belongs to rural area, whereas 108(27%) participants belong to urban area. (Table 4.1.4& Figure 4.1.4). we study the student residential background; we can see that students in rural areas are more inclined to take this course than students in urban areas. 73% of the students are admitted from rural areas.

Figure 3.1.4: Pie chart of residence (native place area) in the study population (N=400)

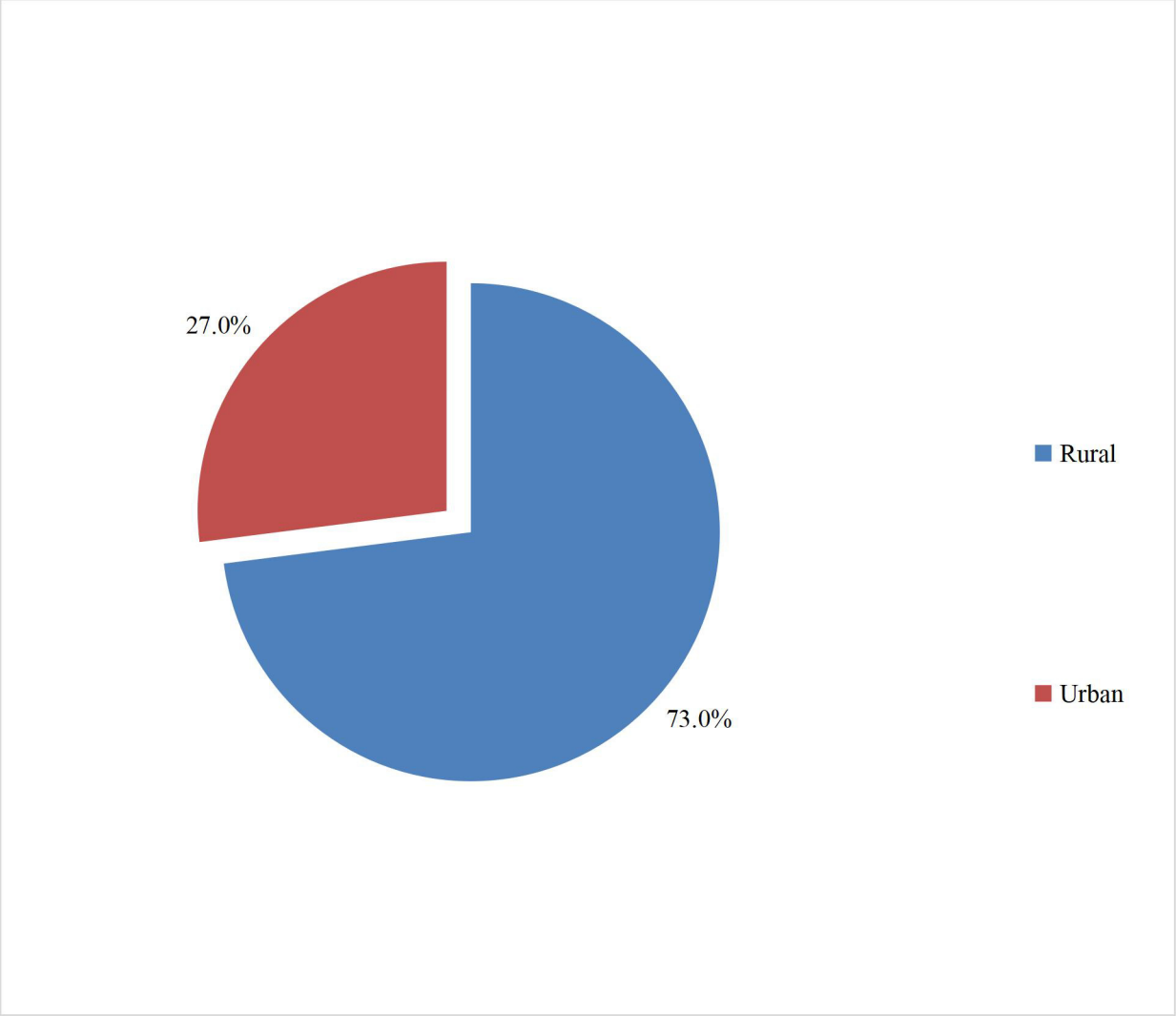


Table 3.1.5: Descriptive analysis of universities where complete there UG in the study population (N=400)

Name of The UG University	Frequency	Percentages
S.R.T.M.University, Nanded	342	85.50%
Other University in Maharashtra	51	12.75%
University in other State	4	1.00%
University in another Country	3	0.75%

Among the study population, 342(85.50%) participants were completed their under graduation from S.R.T.M. University, Nanded, 51(12.75%) participants were from Other University in Maharashtra, 4(1%) participants from university in other State and 3(0.75%) participants were from university in other Country. (Table 4.1.5& Figure 4.1.5)

Figure 3.1.5: Bar chart of name of universities where complete there UG in the study population (N=400)

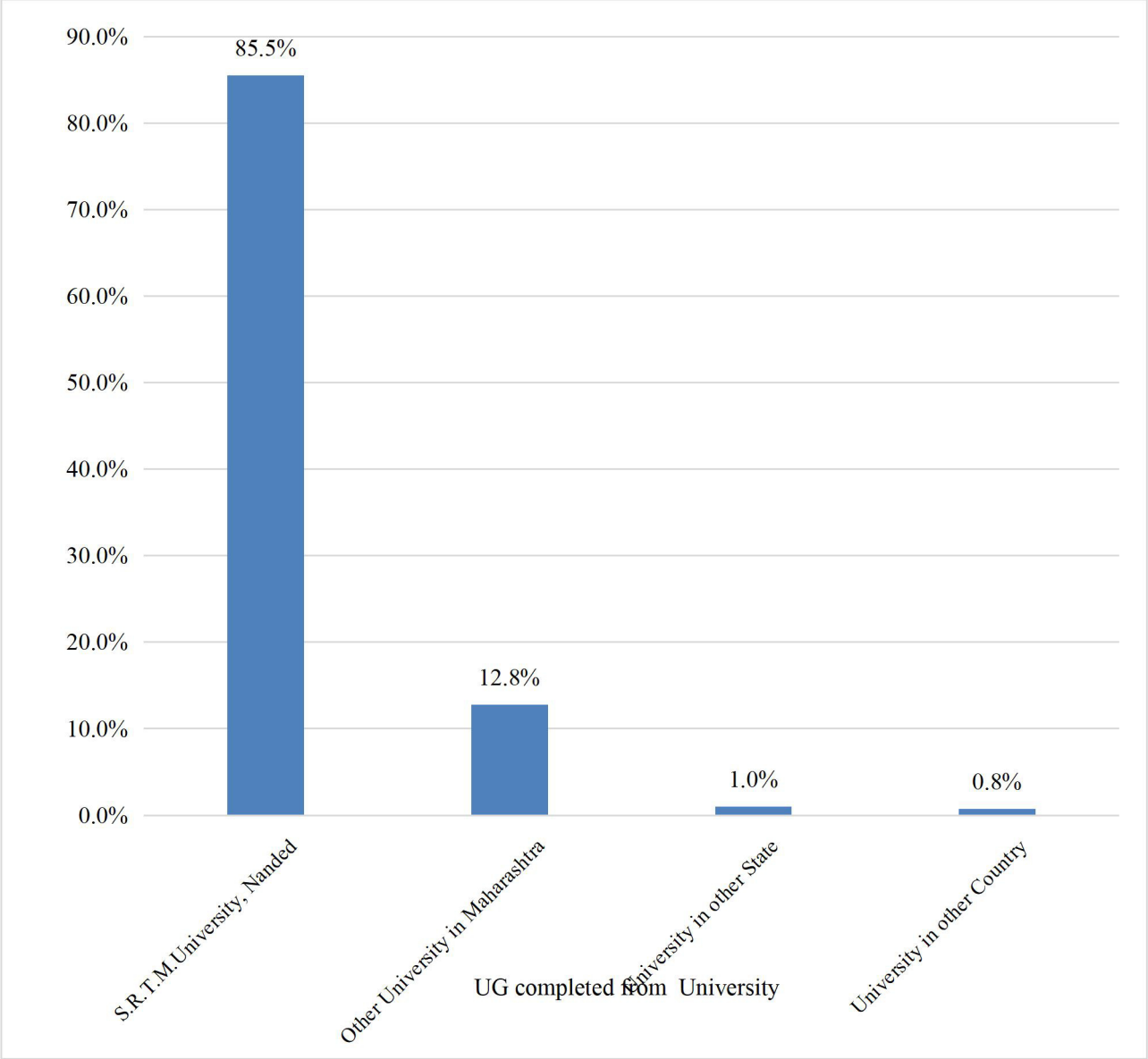


Table 3.1.6: Descriptive analysis of caste category in the study population (N=400)

Caste Category	Frequency	Percentages
SBC	7	1.75%
ST	8	2.00%
EWS	9	2.25%
SC	37	9.25%
VJ-NT	43	10.75%
SEBC	73	18.25%
OBC	83	20.75%
Open	140	35.00%

We observe the caste category differences of the above table, we can see that the caste representation of students admitted to post graduation in mathematics is unequal as per the rules of Government of Maharashtra. The number of students in some categories are getting satisfactory weightage according to their percentage but some are less in percentage while some are more

Figure 3.1.6: Bar chart of caste category in the study population (N=400)

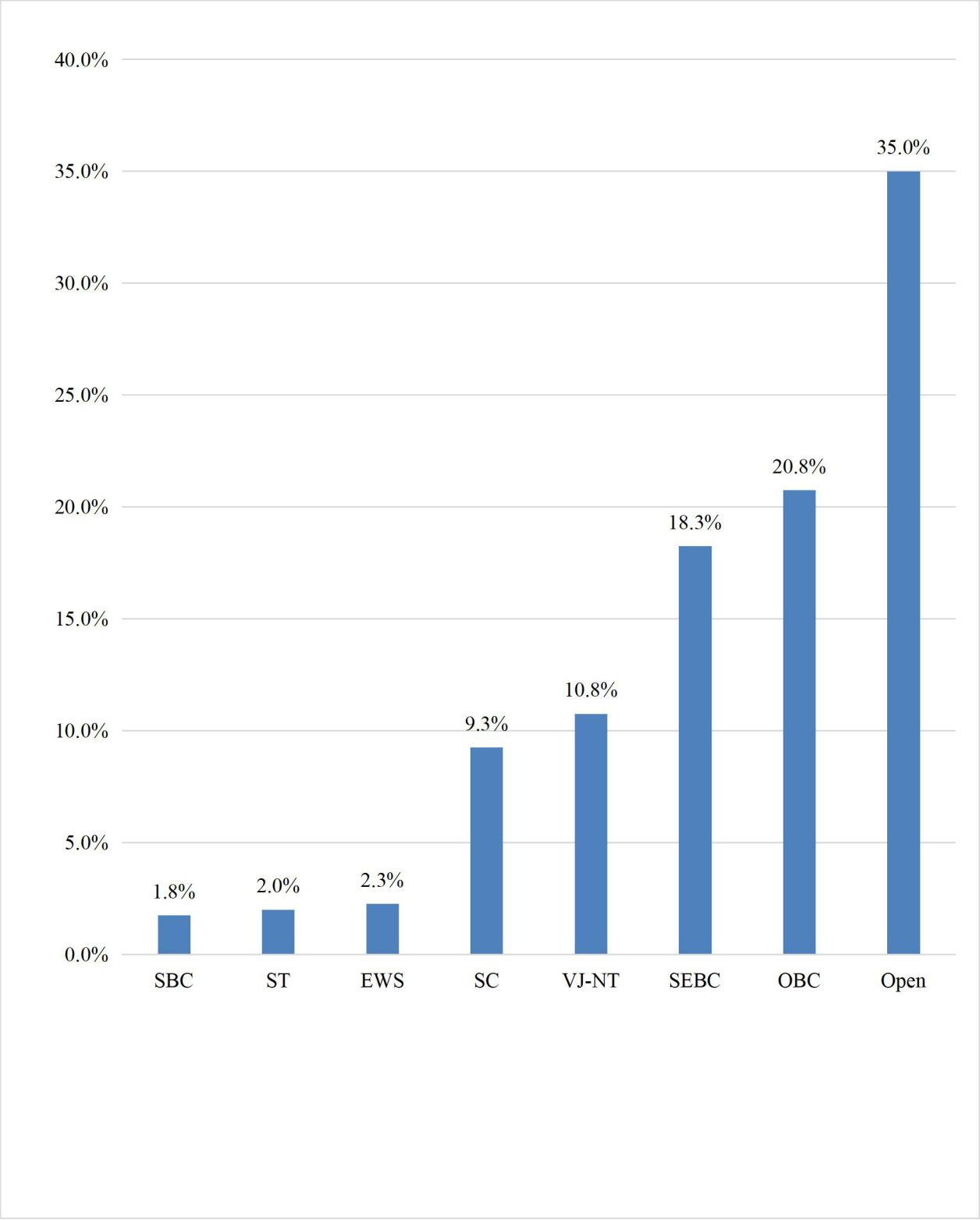


Table 3.1.7: Descriptive analysis of participation in mathematics related activities in the study population (N=400)

Participation in Mathematics Related Activities	Frequency	Percentages
Yes	237	59.25%
No	163	40.75%

Among the study population, 237(59.25%) participants were taken part in mathematical related activities, where 163(40.75%) participants were didn't take part in any mathematical related activity. (Table 4.1.7& Figure 4.1.7)

Figure 3.1.7: Pie chart of participation in mathematics related activities in the study population (N=400)

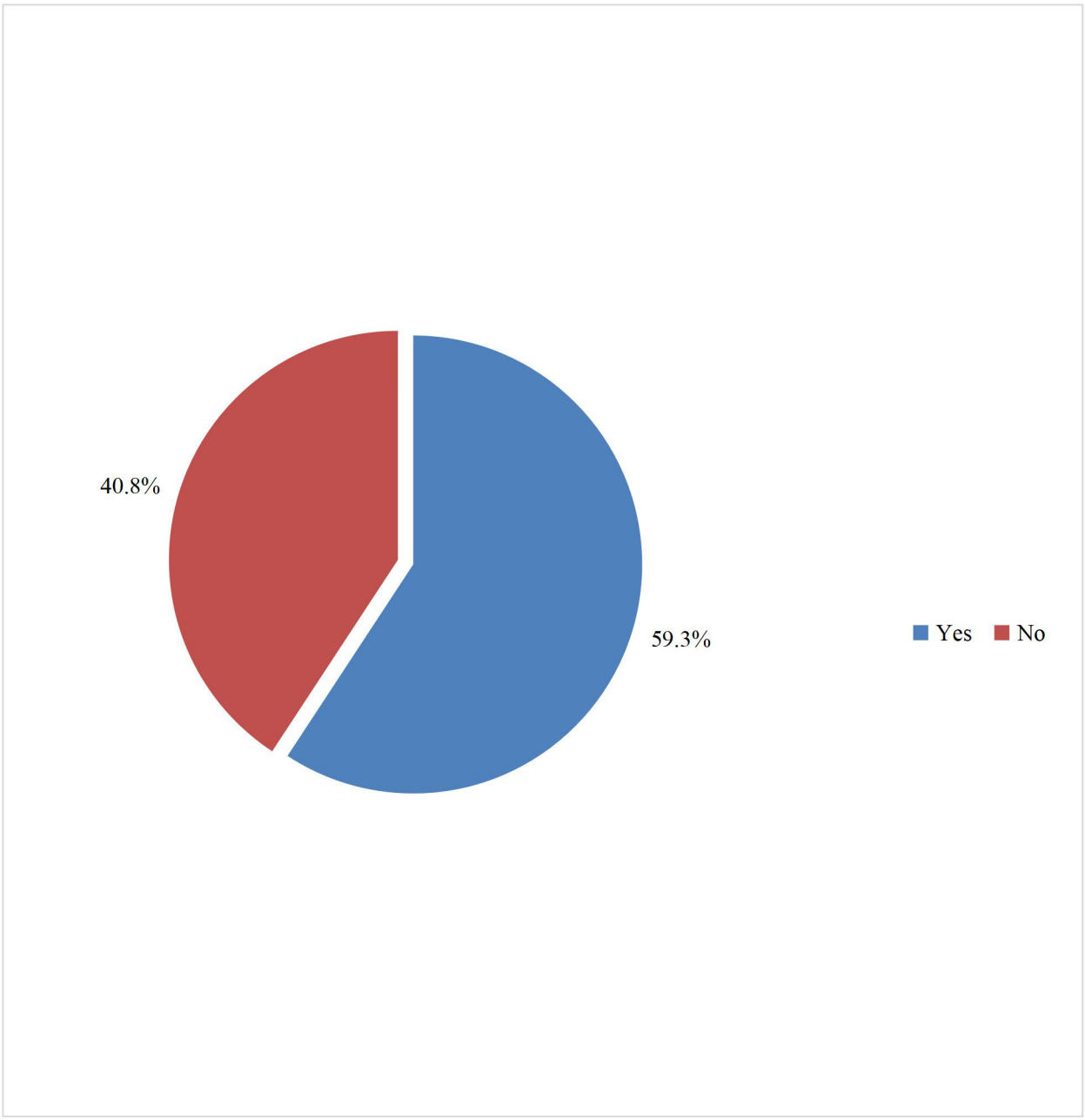


Table 3.1.8: Descriptive analysis of prizes/ranks in mathematics related activities in the study population (N=400)

Prizes/Ranks In Mathematics Related Activities	Frequency	Percentages
Yes	124	31.00%
No	276	69.00%

Among the study population, 124 (31%) participants who get/achieved prizes/ranks, whereas 276 participants were didn't achieved prizes/ranks in any mathematical related activity. (Table 4.1.8& Figure 4.1.8)

Figure 3.1.8: Pie chart of prizes/ranks in mathematics related activities in the study population (N=400)

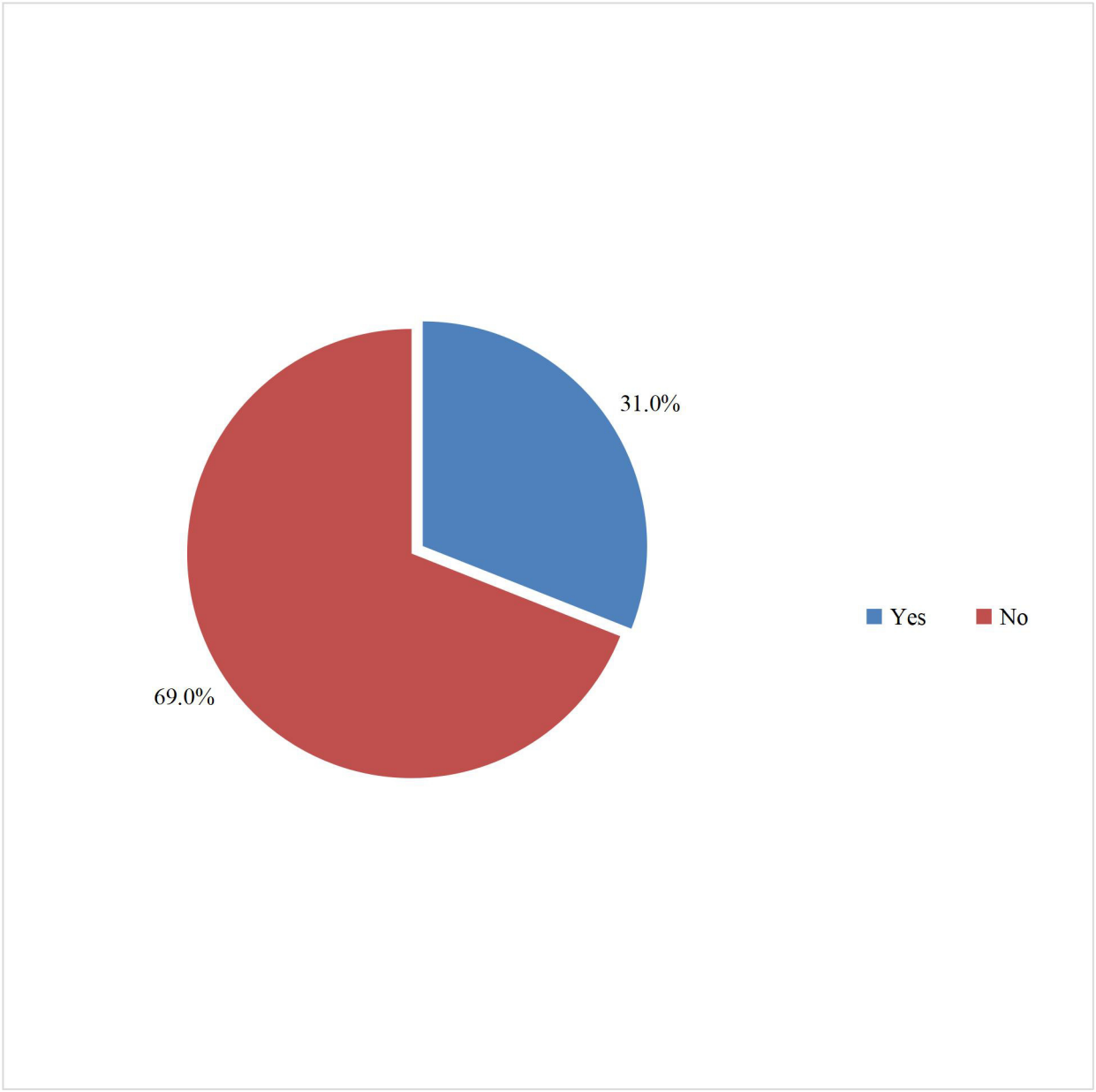


Table 3.1.9: Descriptive analysis of test score in study population (N=400)

Parameter	Mean ± SD	Median	Minimum	Maximum	95% C.I.	
					Lower	Upper
Test Score	35.2 ± 10.63	36.0	14.0	50.0	34.2	36.3

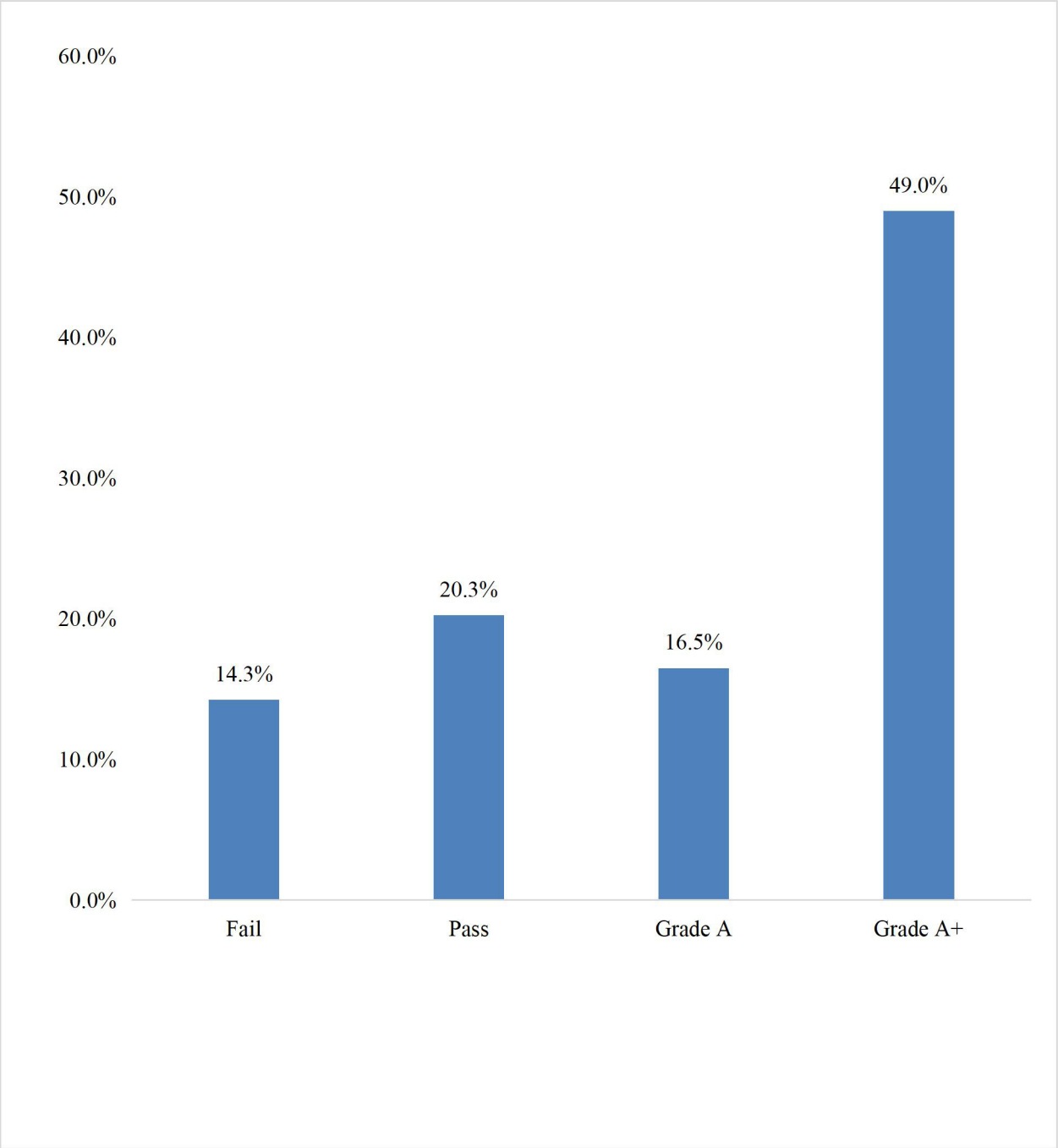
The mean Test Score was 35.2 ± 10.63 in the study population, minimum score was 14 and maximum age was 50 in the study population (95% CI 34.2 to 36.3).

Table 3.1.10: Descriptive analysis of test score in the study population (N=400)

Mathematical Ability (Test Score)	Frequency	Percentages
Fail (<20)	57	14.25%
Pass (20-30)	81	20.25%
Grade A (30-36)	66	16.50%
Grade A^+ (>36)	196	49.00%

Among the study population, 57(14.25%) participants were failed, 81(20.25%) participants were pass, 66(16.50%) participants were getting Grade A, and 196(49%) participants were getting Grade A^+ in the test.

Figure 3.1.10: Bar chart of test score in the study population (N=400)



3.2 Data Analysis

In this section we have obtained whether gender, residence and caste category factor are significant or not in admission for post-graduation in mathematics. We also obtained whether gender and residence factor are significant or not in participation as well as achievement in mathematics related activities and mathematical abilities. Results are obtained by using chi-square test.

Table 3.2.1: Comparison of residence (native place area) between gender (N=400)

Residence (Native Place Area)	**Gender**		**Chi square**	**P value**
	Male (N=136)	**Female (N=264)**		
Rural	119 (87.5%)	173 (65.53%)	21.981	0.001
Urban	17 (12.5%)	91 (34.47%)		

There is statistically significant difference in Gender between residences (native place area) withP value 0.001.

Figure 3.2.1: Staked bar chart of comparison of residence (native place area) between gender (N=400)

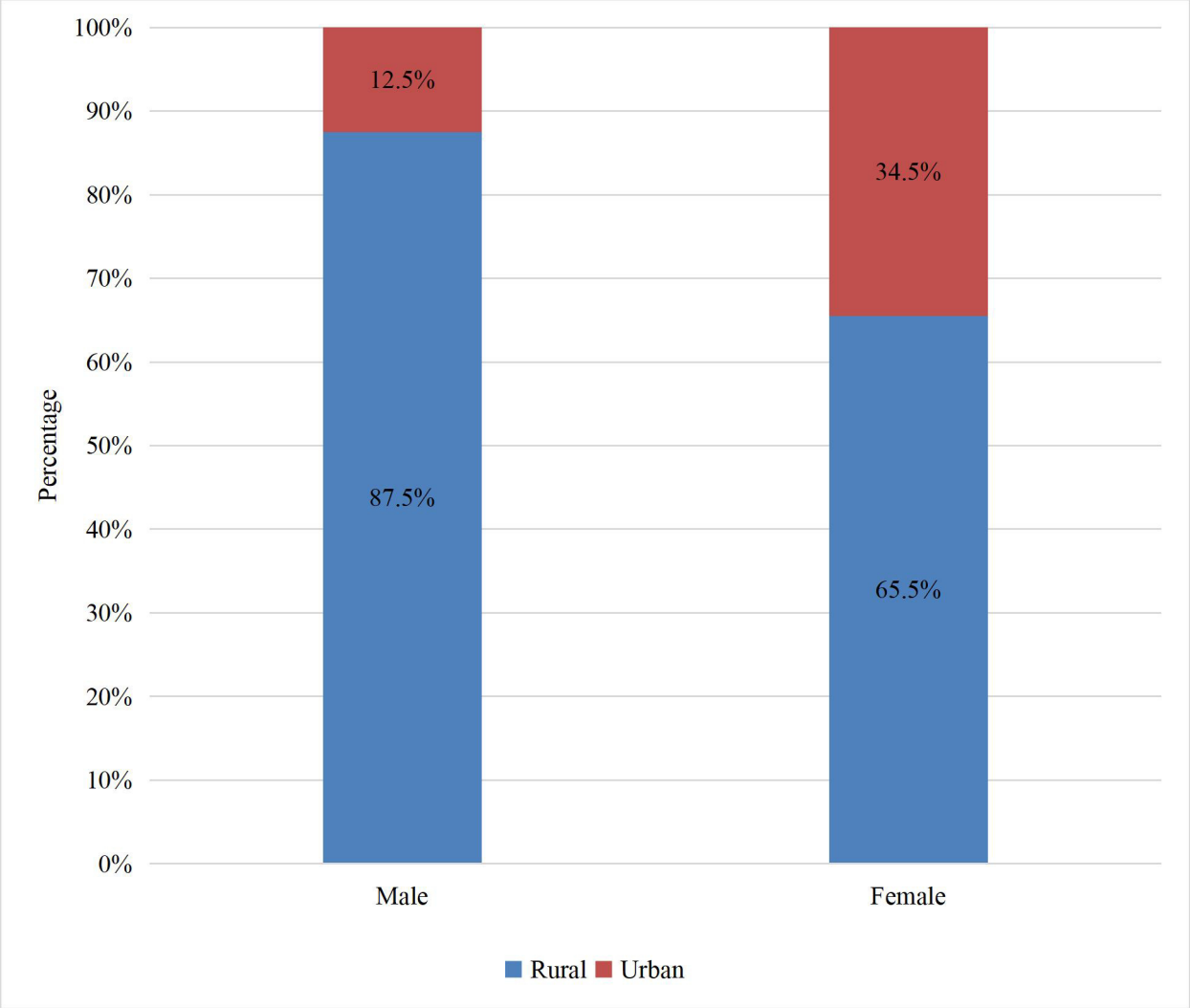


Table 3.2.2: Comparison of participation in mathematics related activities between genders

Participation in Mathematics Related Activities	Gender		Chi square	P value
	Male (N=136)	Female (N=264)		
Yes	84 (61.76%)	153 (57.95%)	0.540	0.463
No	52 (38.24%)	111 (42.05%)		

There is no statistically significant difference in Gender between participation in mathematics related activities withP value 0.463.

Figure 3.2.2: Staked bar chart of comparison of participation in mathematics related activities between gender (N=400)

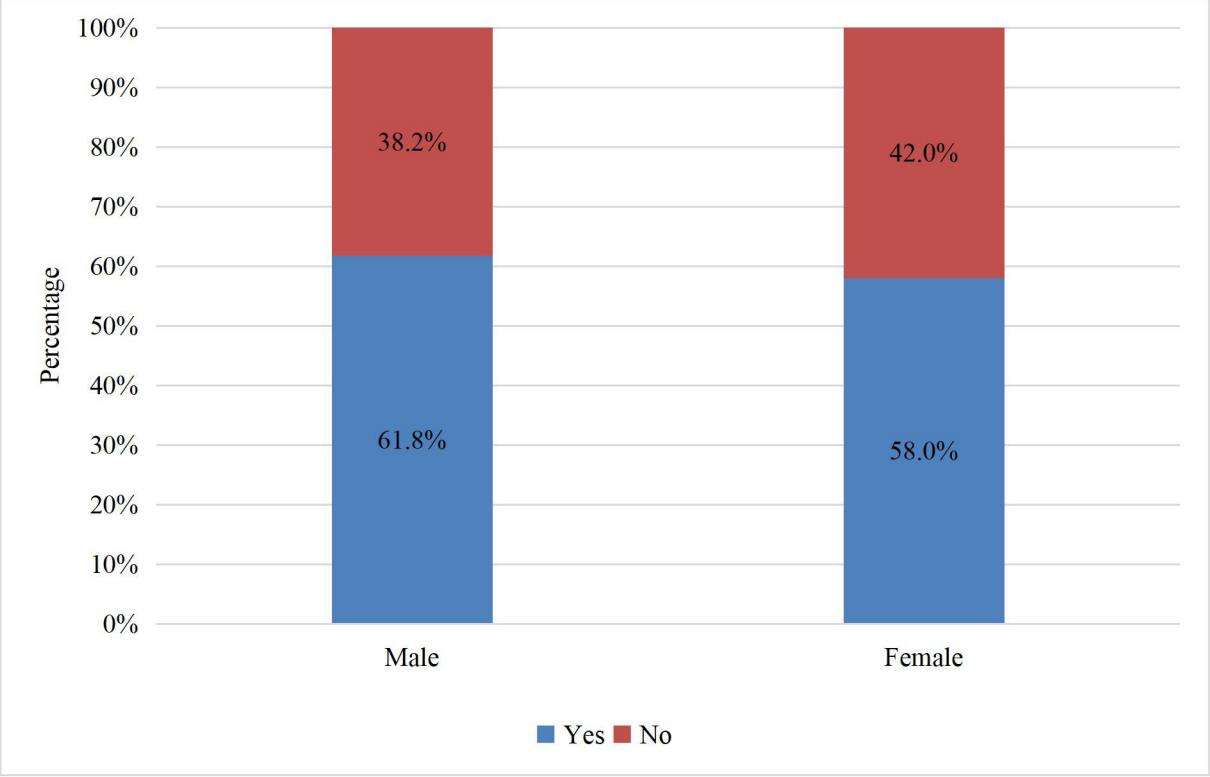


Table 3.2.3: Comparison of participation in mathematics related activities between residence

Participation in Mathematics Related Activities	Residence (Native Place Area)		Chi square	P value
	Rural (N=292)	Urban (N=108)		
Yes	176 (60.27%)	61 (56.48%)	0.470	0.493
No	116 (39.73%)	47 (43.52%)		

There is no statistically significant difference in Residence (Native Place Area) between participation in mathematics related activities withP value 0.493.

Figure 3.2.3: Staked bar chart of comparison of participation in mathematics related activities between residence (native place area) (N=400)

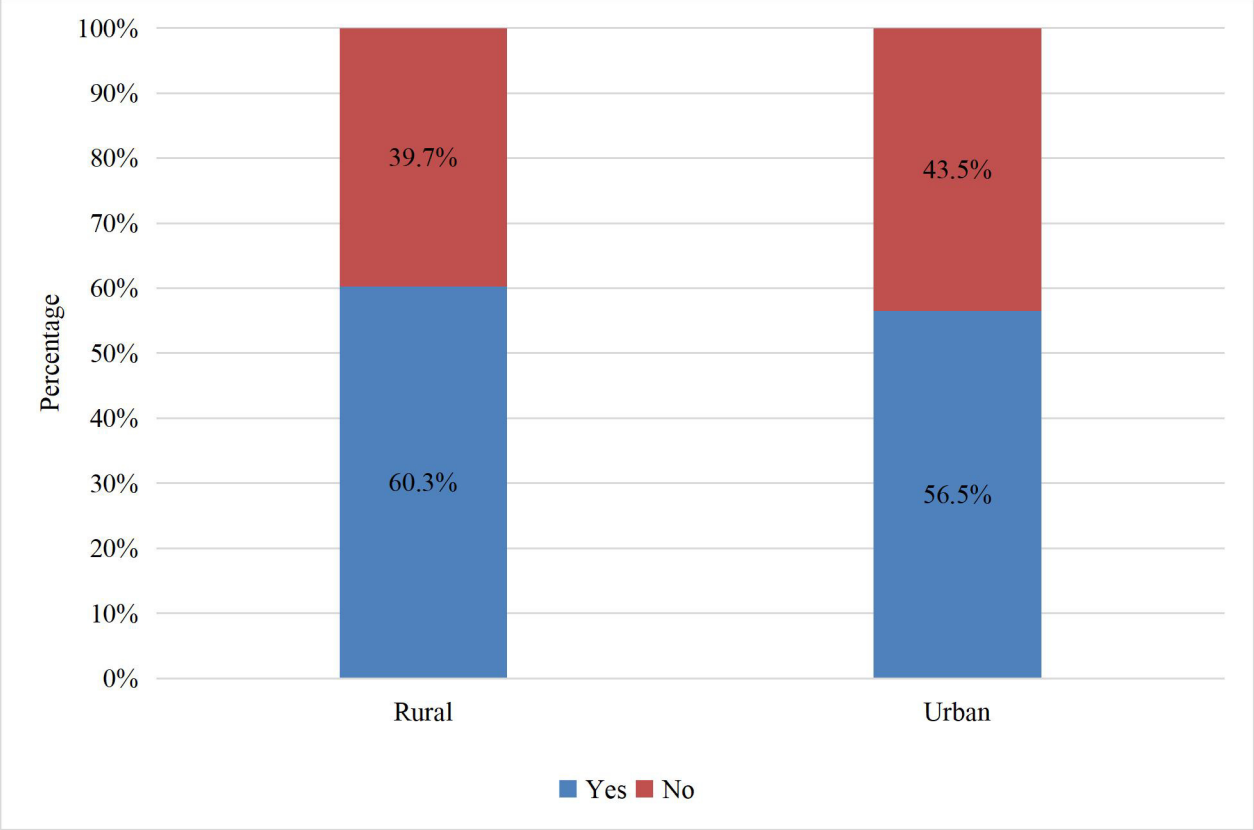


Table 3.2.4: Comparison of prizes/ranks in mathematics related activities between gender

Prizes/Ranks in Mathematics Related Activities	Gender		Chi square	P value
	Male (N=136)	Female (N=264)		
Yes	53 (38.97%)	71 (26.89%)	6.120	0.013
No	83 (61.03%)	193 (73.11%)		

There is statistically significant difference in Gender between getting prizes/ranks in mathematics related activities withP value 0.013. It means that there is relation between male and female students getting prizes in mathematics related activities.

Figure 3.2.4: Staked bar chart of comparison of prizes/ranks in mathematics related activities between gender (N=400)

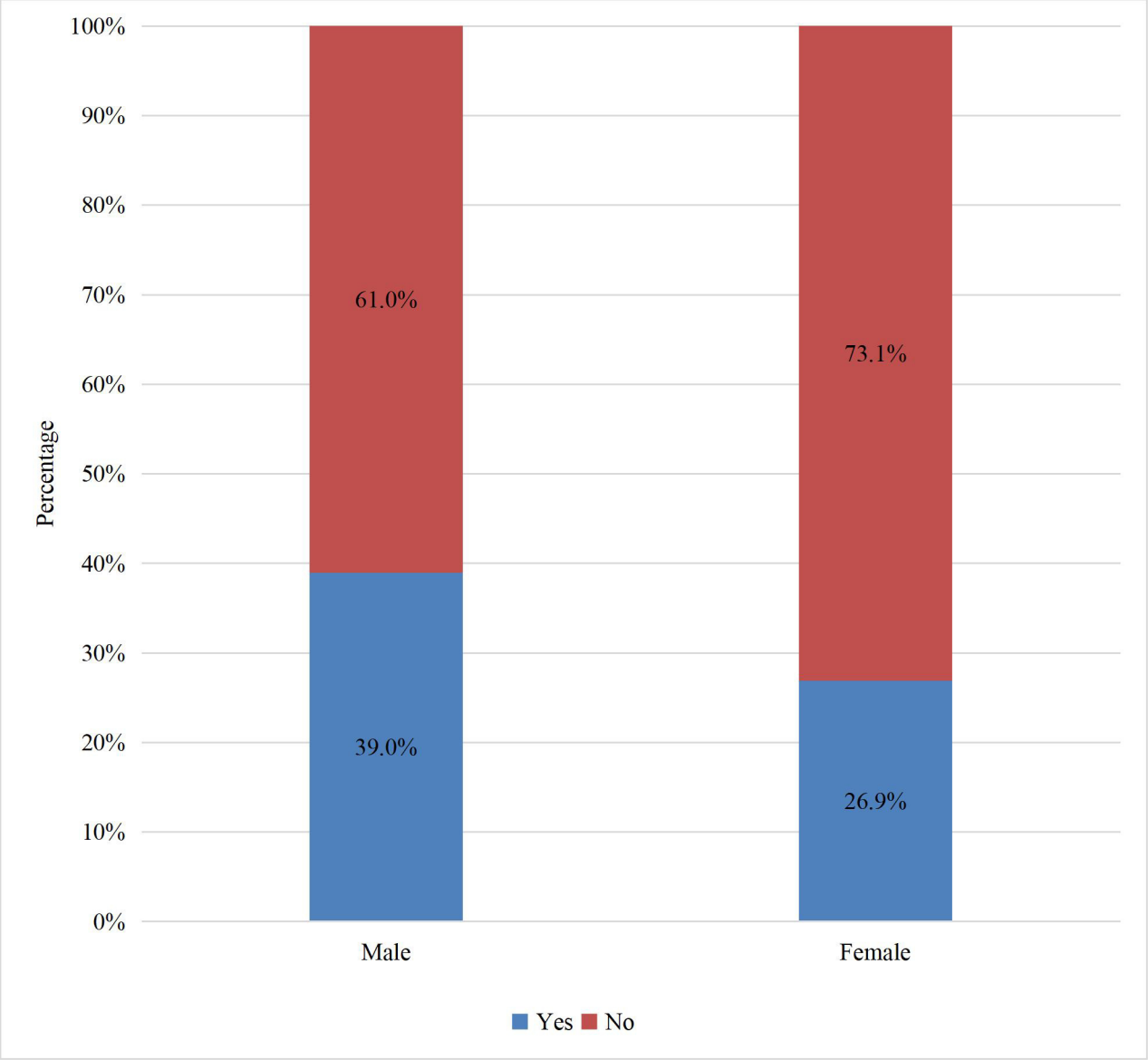


Table 3.2.5: Comparison of prizes/ranks in mathematics related activities between residences

Prizes/Ranks in Mathematics Related Activities	Residence (Native Place Area)		Chi square	P value
	Rural (N=292)	Urban (N=108)		
Yes	97 (33.22%)	27 (25%)	2.490	0.115
No	195 (66.78%)	81 (75%)		

There is no statistically significant difference in Residence (Native Place Area) between Prizes/Ranks in Mathematics Related Activities with P value 0.115.

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Figure 3.2.5: Staked bar chart of comparison of prizes/ranks in mathematics related activities between residence (native place area) (N=400)

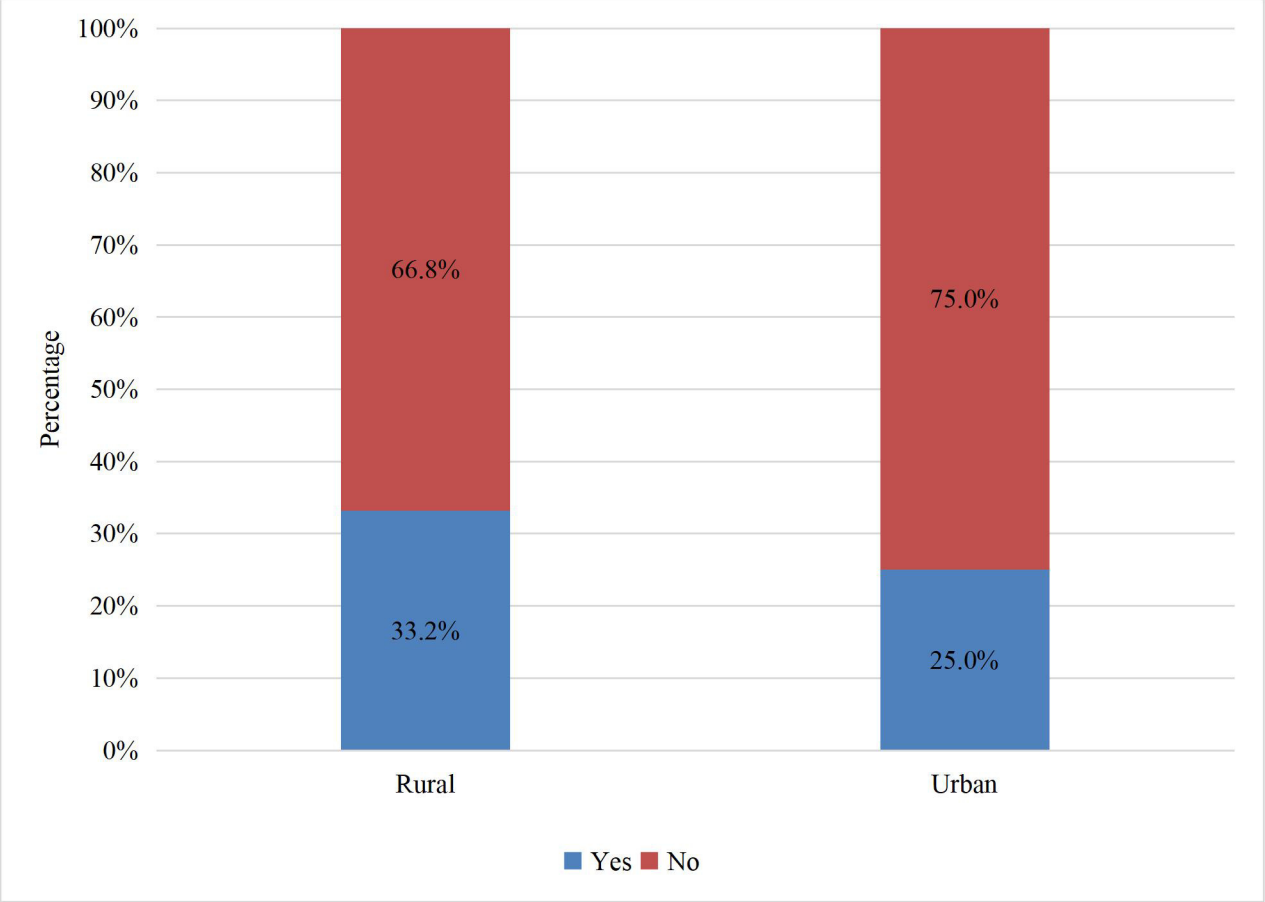


Table 3.2.6: Comparison of mean of test score between gender (N=400)

Parameter	Gender (Mean± SD)		P value
	Male (N=136)	Female (N=264)	
Test Score	35.34 ± 11.68	35.13 ± 10.07	0.852

There was no statistically significant difference in Mean Test Score between Genderwith P value 0.852. (Table 4.2.6)

Table 3.2.7: Comparison of mean of test score between residence (native place area) (N=400)

Parameter	Residence (Native place area) (Mean± SD)		P value
	Rural (N=292)	Urban (N=108)	
Test Score	34.56 ± 10.86	36.93 ± 9.84	0.048

There was statistically significant difference in Mean Test Score between Residence (Native place area) with P value 0.048.

Table 3.2.8: Comparison of mathematical ability (test score) between gender (N=400)

Mathematical Ability (Test Score)	Gender		Chi square	P value
	Male (N=136)	Female (N=264)		
Fail	27 (19.85%)	30 (11.36%)	9.461	0.024
Pass	22 (16.18%)	59 (22.35%)		
Grade A	16 (11.76%)	50 (18.94%)		
Grade A+	71 (52.21%)	125 (47.35%)		

There was statistically significant difference in Gender between Mathematical Ability Test Score withP value 0.024. generally, our society assume that boys are intelligent in mathematics subject and girls are intelligent in life sciences subject. But here we observe that (Table 4.2.8), female students are more intelligent in mathematics than boys.

Figure 3.2.8: Staked bar chart of comparison of mathematical ability (test score) between gender (N=400)

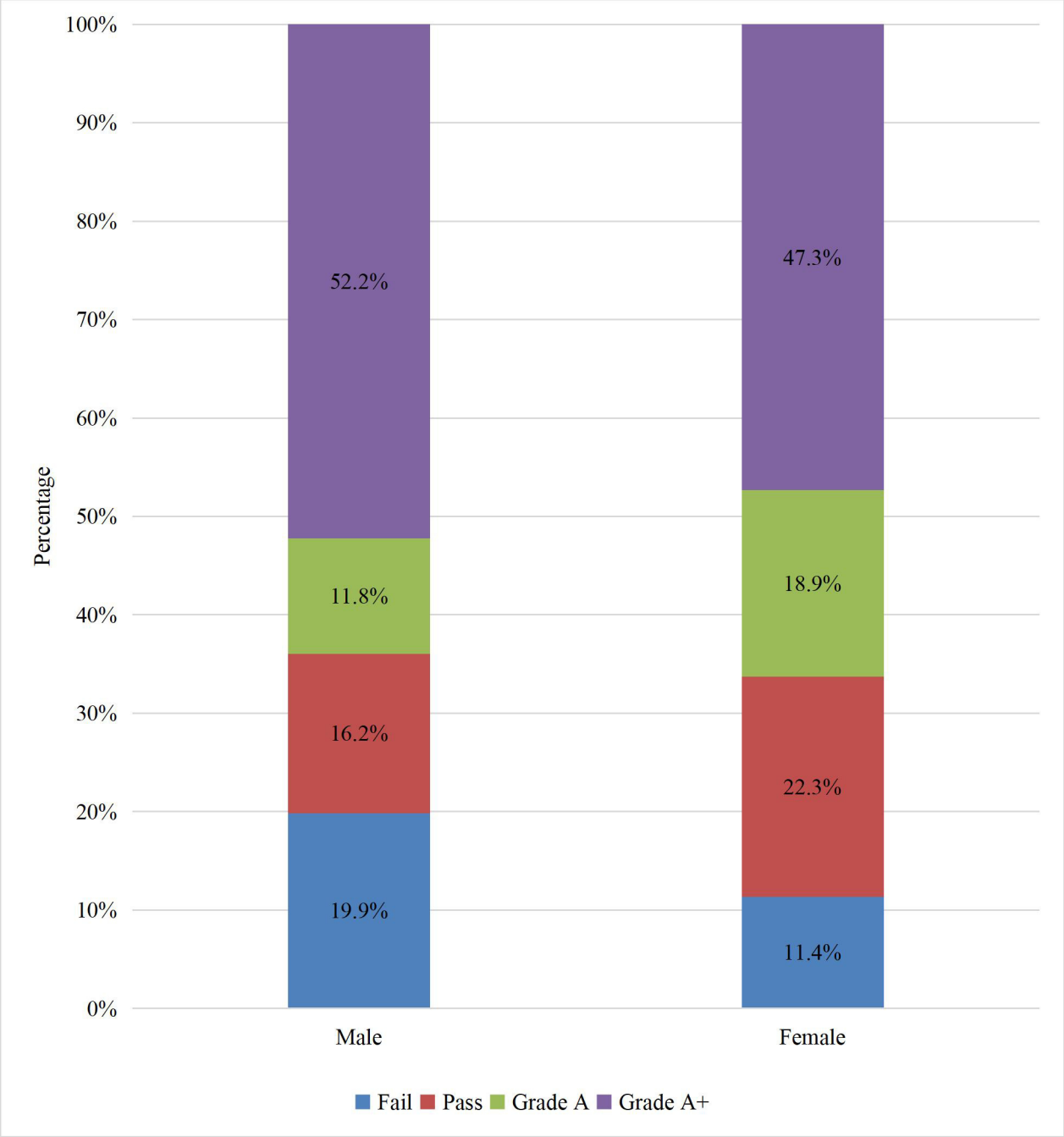


Table 3.2.9: Comparison of mathematical ability (test score) between residence (native place area) (N=400)

Mathematical Ability (Test Score)	Residence (Native Place Area)		Chi square	P value
	Rural (N=292)	Urban (N=108)		
Fail	48 (16.44%)	9 (8.33%)	5.546	0.136
Pass	61 (20.89%)	20 (18.52%)		
Grade A	48 (16.44%)	18 (16.67%)		
Grade A+	135 (46.23%)	61 (56.48%)		

There was no statistically significant difference in Residence (Native Place Area) between mathematical ability test score with P value 0.136. generally, our society assume that student from urban areas is intelligent in mathematics and science subject and student from rural are background intelligent in social sciences subject. But here we observe that (Table 4.2.9), there is no relation between rural and urban students in mathematical ability score.

Figure 3.2.9: Staked bar chart of comparison of mathematical ability (test score) between residence (native place area) (N=400)

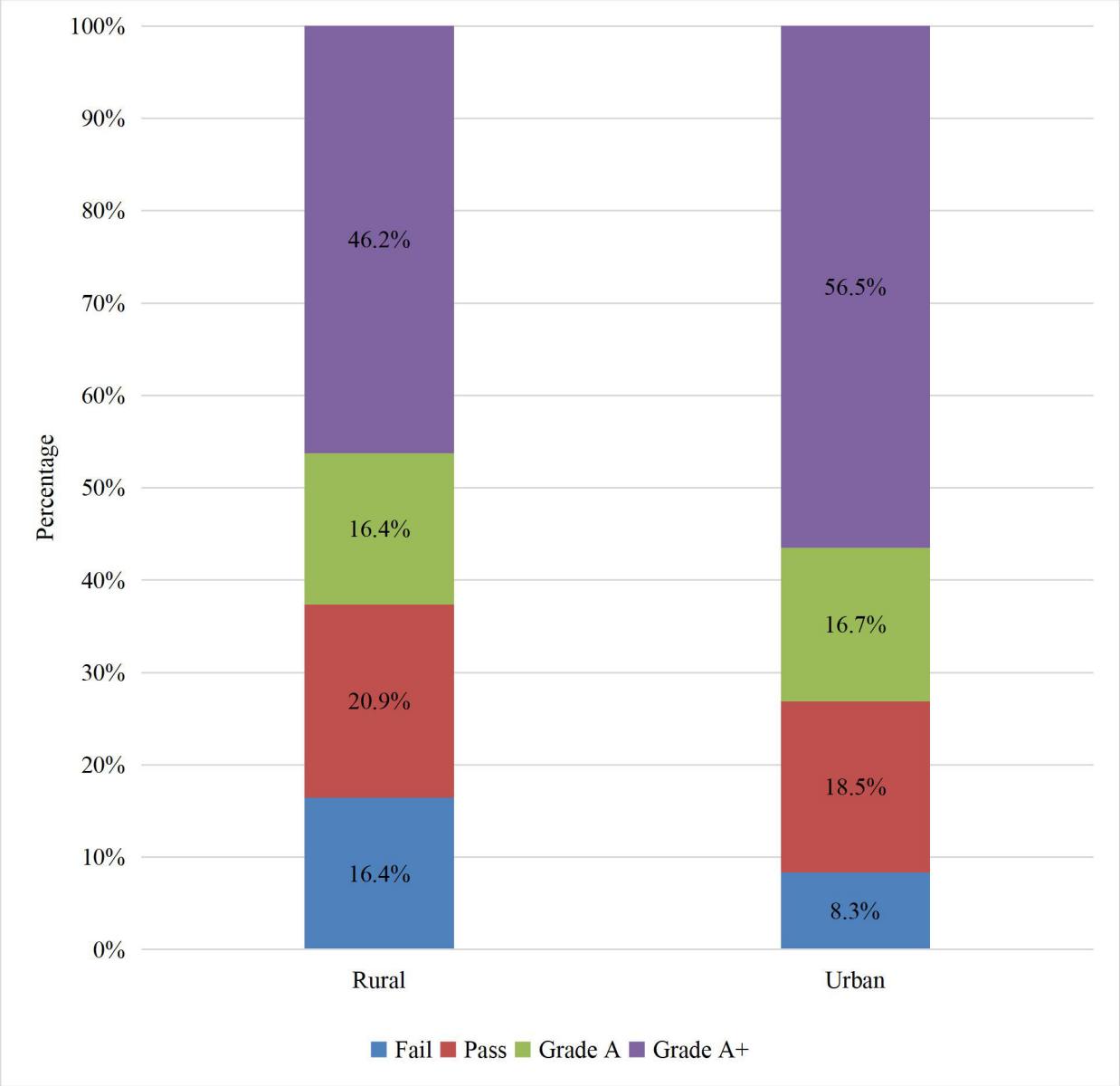


Table 3.2.10: Comparison of Family Income status between mathematical abilities (N=400)

Family Monthly Income	Mathematical ability test		Chi square	P value
	Fail (N=57)	Pass (N=343)		
Below 20000	27 (47.36%)	85 (24.78%)	14.79	0.002
20000-60000	15 (26.31%)	162 (47.23%)		
60000-120000	9 (15.78%)	70 (20.40%)		
Above 120000	6 (10.52%)	26 (7.58%)		

There was statistically significant difference in Socio-economic between mathematical abilities with P value 0.002.

Figure 3.2.10: Staked bar chart of comparison of Family Income status between mathematical abilities (N=400)

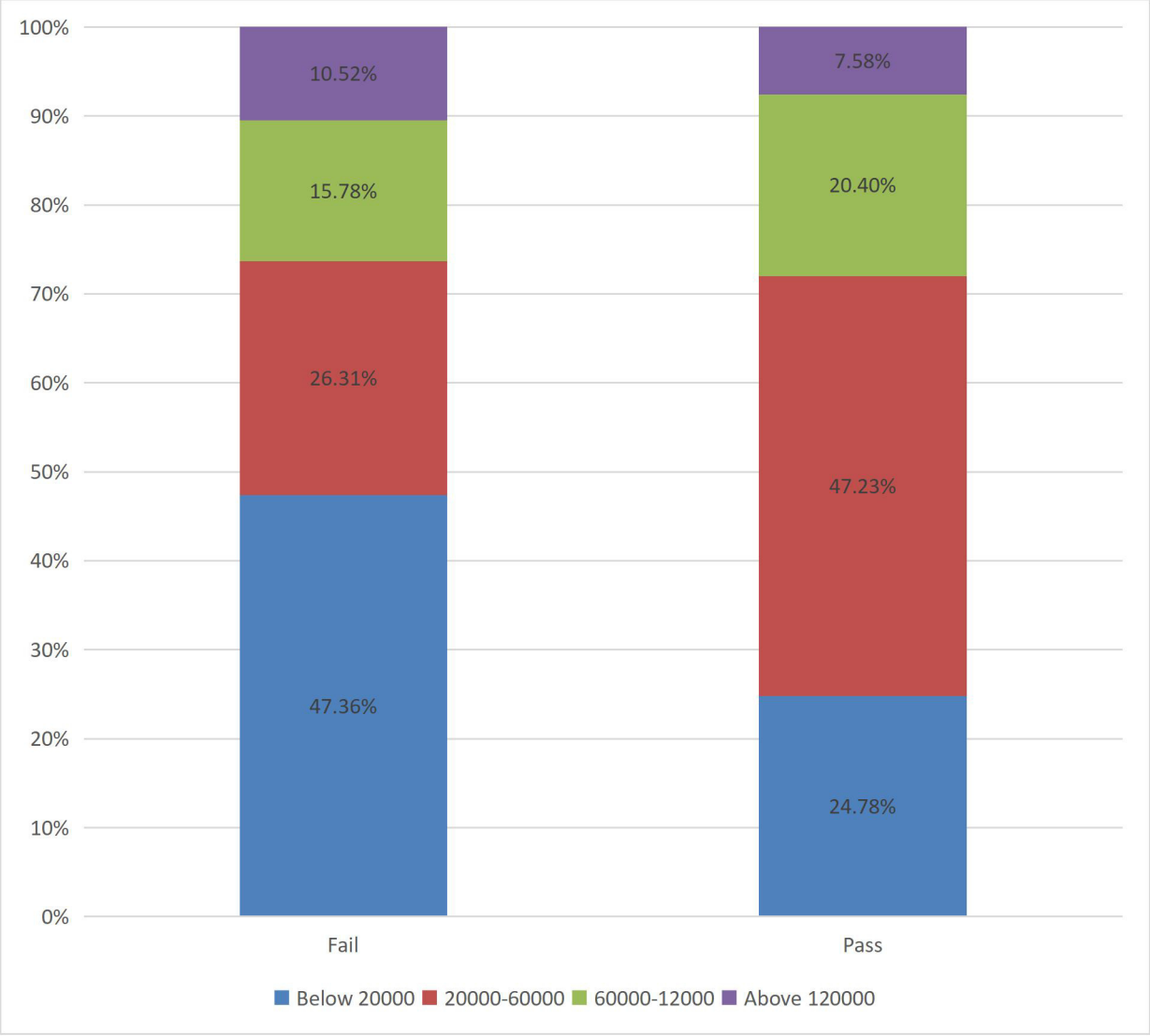


Table 3.2.11: Comparison of Parents occupation status between mathematical abilities (N=400)

Parents occupation	Mathematical ability test		Chi square	P value
	Fail (N=57)	Pass (N=343)		
Agriculture	32 (56.14%)	151 (44.02%)	16.30	0.009
Business	13 (22.80%)	33 (9.62%)		
Services	8 (14.03%)	111 (32.36%)		
Teaching	4 (7.01%)	48 (13.99%)		

There was statistically significant difference in Parents occupation between mathematical abilities with P value 0.009

Figure 3.2.11: Staked bar chart of comparison of Parents occupation status between mathematical abilities (N=400)

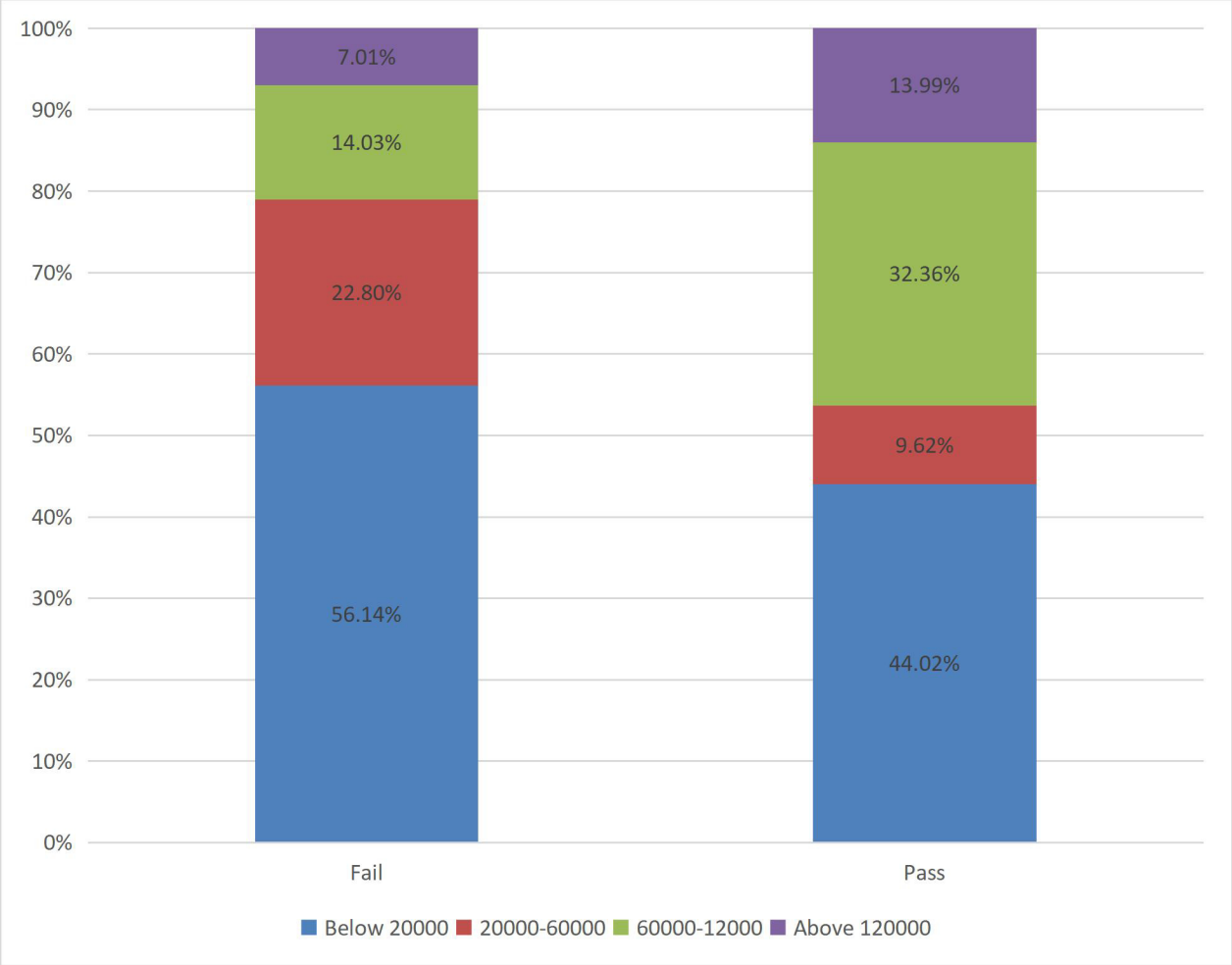


Table 3.2.12: Comparison of caste category between gender (N=400)

Caste Category	Gender		Chi square	P value
	Male (N=136)	Female (N=264)		
EWS	2 (1.47%)	7 (2.65%)	6.244	0.512
OBC	29 (21.32%)	54 (20.45%)		
OPEN	51 (37.5%)	89 (33.71%)		
SBC	0 (0%)	7 (2.65%)		
SC	14 (10.29%)	23 (8.71%)		
SEBC	22 (16.18%)	51 (19.32%)		
ST	4 (2.94%)	4 (1.52%)		
VJNT	14 (10.29%)	29 (10.98%)		

There was no statistically significant difference in castes between gender with P value 0.512

Figure 3.2.12.: Staked bar chart of comparison of caste category between gender (N=400)

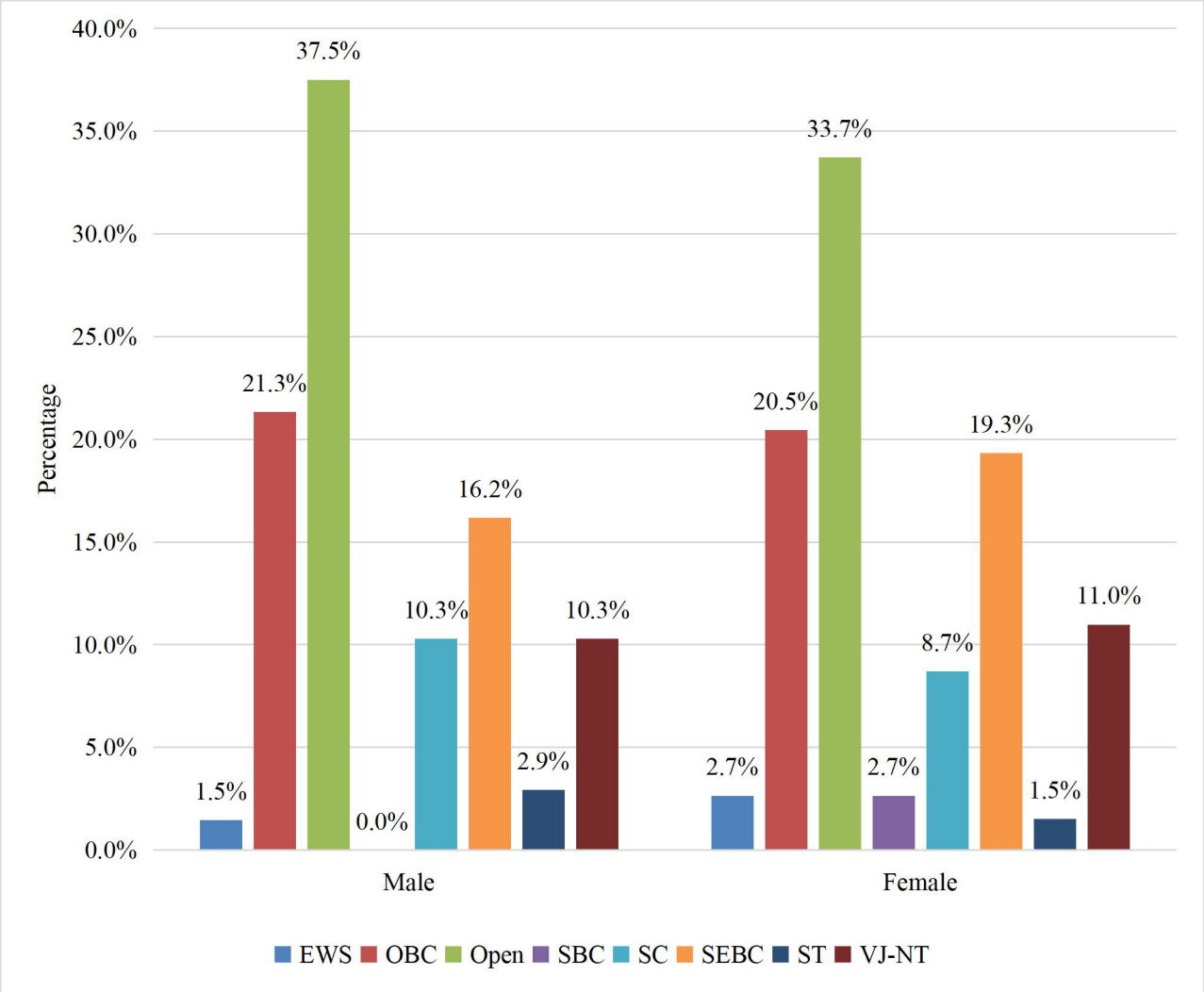


Table 3.2.13: Comparison of caste category between residence (native place area) (N=400)

Caste Category	Residence (Native Place Area)		Chi square	P value
	Rural (N=292)	Urban (N=108)		
EWS	6 (2.05%)	3 (2.78%)	8.314	0.306
OBC	66 (22.6%)	17 (15.74%)		
OPEN	98 (33.56%)	42 (38.89%)		
SBC	4 (1.37%)	3 (2.78%)		
SC	26 (8.9%)	11 (10.19%)		
SEBC	58 (19.86%)	15 (13.89%)		
ST	7 (2.4%)	1 (0.93%)		
VJNT	27 (9.25%)	16 (14.81%)		

There was no statistically significant difference in castesbetween residence with P value 0.306

Figure 3.2.13: Staked bar chart of comparison of caste category between residence (native place area) (N=400)

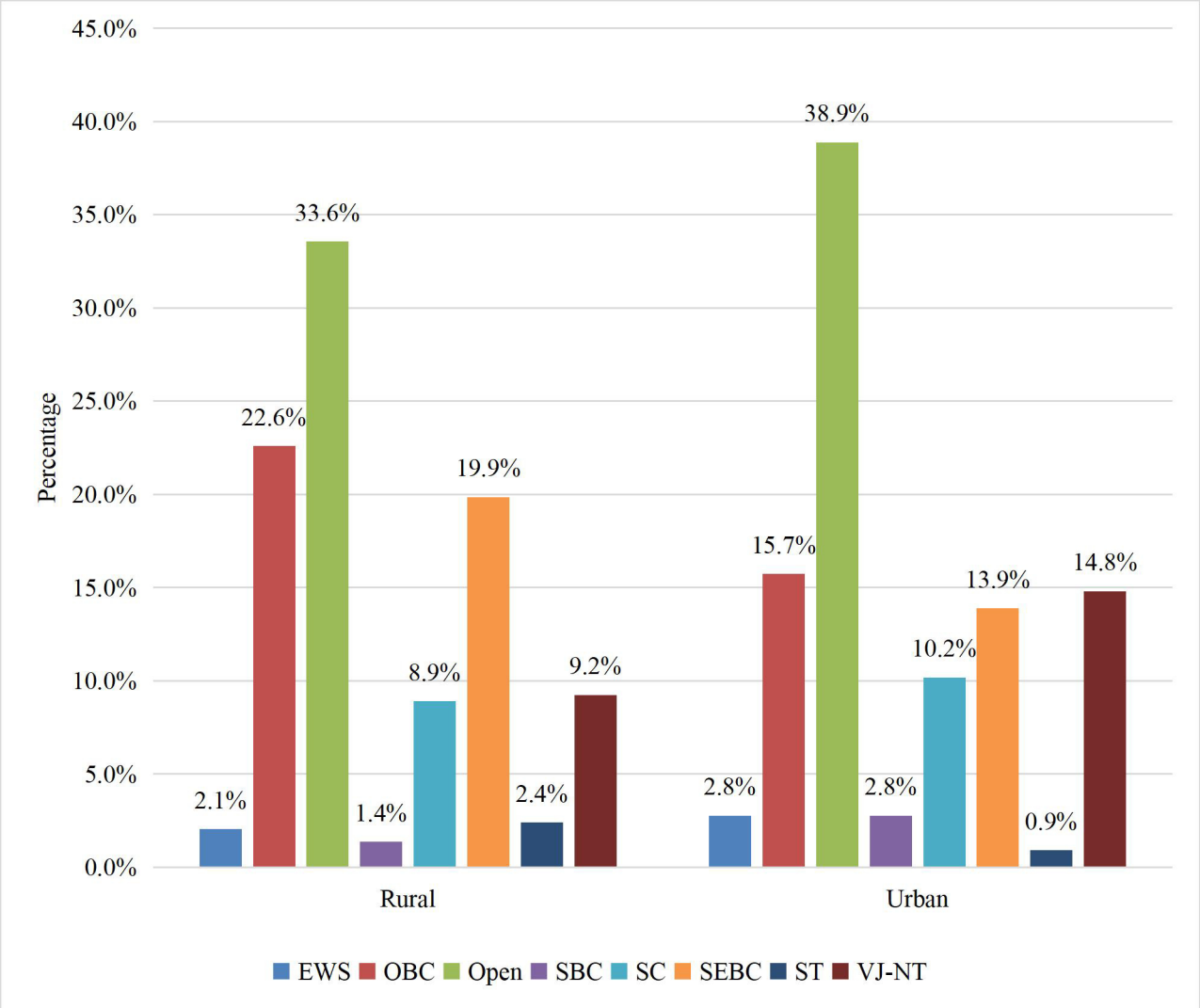
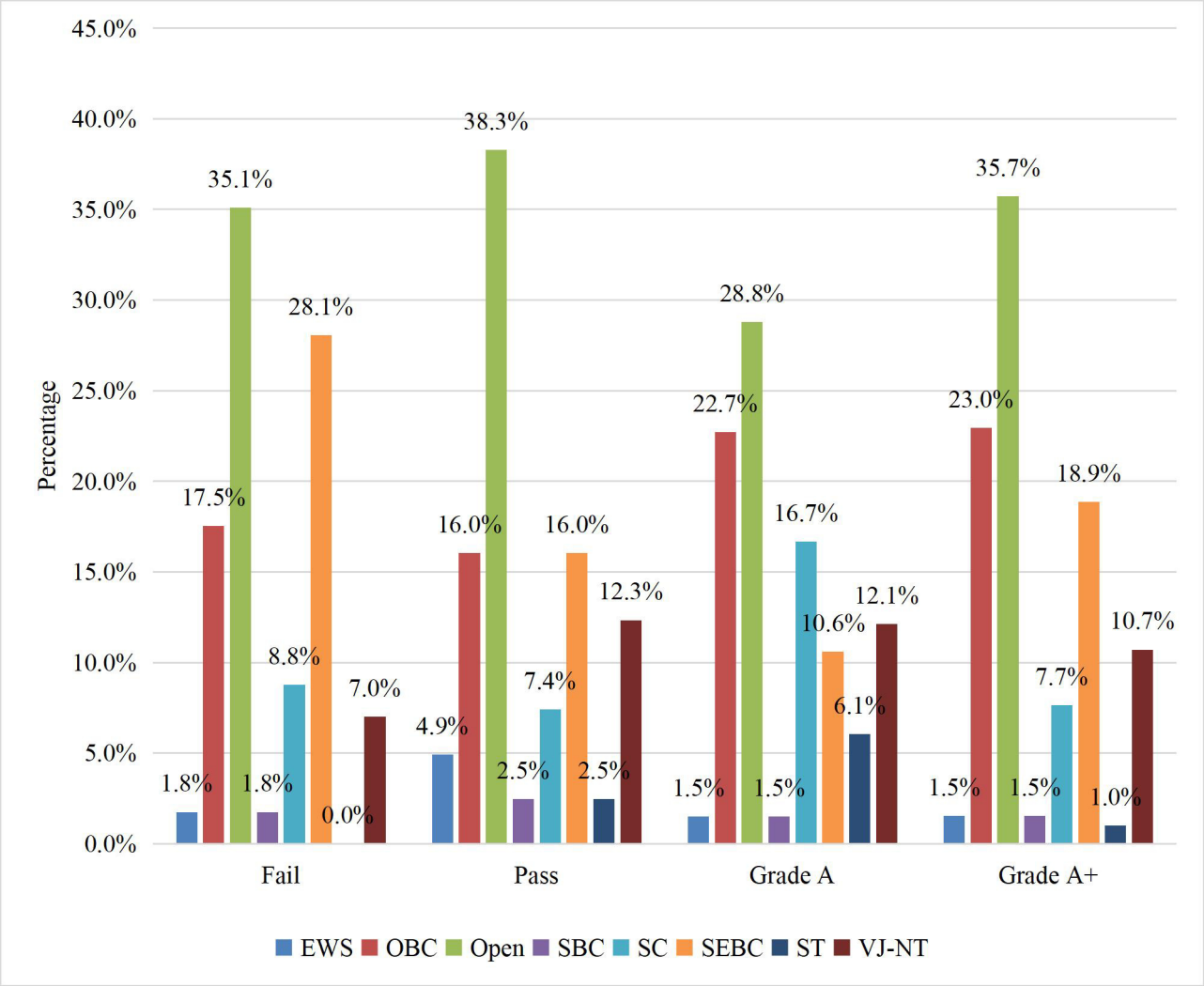


Table 3.2.14: Comparison of caste category across mathematical ability (test score) (N=400)

Caste Category	Mathematical Ability (Test Score)				Chi square	P value
	Fail (N=57)	Pass (N=81)	Grade A (N=66)	Grade A+ (N=196)		
EWS	1 (1.75%)	4 (4.94%)	1 (1.52%)	3 (1.53%)	25.137	0.241
OBC	10 (17.54%)	13 (16.05%)	15 (22.73%)	45 (22.96%)		
OPEN	20 (35.09%)	31 (38.27%)	19 (28.79%)	70 (35.71%)		
SBC	1 (1.75%)	2 (2.47%)	1 (1.52%)	3 (1.53%)		
SC	5 (8.77%)	6 (7.41%)	11 (16.67%)	15 (7.65%)		
SEBC	16 (28.07%)	13 (16.05%)	7 (10.61%)	37 (18.88%)		
ST	0 (0%)	2 (2.47%)	4 (6.06%)	2 (1.02%)		
VJNT	4 (7.02%)	10 (12.35%)	8 (12.12%)	21 (10.71%)		

There was no statistically significant difference in castesbetween mathematical abilities with P value 0.241

Figure 3.2.14: Staked bar chart of comparison of caste category across mathematical ability (test score) (N=400)



Chapter 4
Research Results and Conclusion

4.1.Demographic Analysis

1. If we observe above table, we can see that the trend of admission to post-graduation in Mathematics is more of girls than boys. From total admission 66% of the girls have taken this course. Although good, but there is a special reason behind this. In backward areas like Marathwada, education to boys is still given importance and more amount is spent on their education. In these areas boys are encouraged by their families for education, therefore more and more boys get admission in medical, engineering and professional courses after 12th standard. Even today, parents in this region are not ready to send girls for education in metro cities, so most of the girls enroll in a basic science course like B.Sc. in the college of their village or town after 12th standard. Therefore, after graduation most of the girls come to post-graduation. (Table 3.1.1)

2. Similarly, if we study the student residential background, we will see that students in rural areas are more inclined to take this course than students in urban areas. 73% of the students are admitted from rural areas. One of the reasons for this is that most of the students living in urban areas have a good financial situation so that they can get a good college education and get expensive tuitions. Therefore, these students easily pass the qualifying entrance examination of medical, engineering courses and get admission in that course. On the other hand, due to poor financial condition of rural

students, they cannot afford expensive tuitions. They cannot come to the city to pursue their education. So, most of the rural students enroll in a basic science course like B.Sc. in the college of their town after 12th standard. After B.Sc. they prefer to take admission to post graduation. (Table 3.1.4)

3. If we observe the caste category differences of the above table, we can see that the caste representation of students admitted to post graduation in mathematics is unequal as per the rules of Government of Maharashtra. The number of students in some categories are getting satisfactory weightage according to their percentage but some are less in percentage while some are more. It is seen that SC and ST students are still far away from higher education, very few students have taken admission in this course. As per quota ST candidates 5% seats and SC candidates near about 4% seats are vacant. The representation of OBC, VJNT, SBC students is almost correct in terms of their percentage, while the representation of EWS students is very low. Only 2.25% of the seats have been filled through EWS instead of 10%, the reason being the same, as the reservation was recently implemented by the central government, the second-year students in this sample did not get the benefit of reservation and many students did not have EWS certificate at the time of admission. So EWS quota appears with less students. The fact that the representation of OPEN and SEBC cadre students is higher in terms of their percentage shows that the students in this cadre are leading in admission to this course. (Table 3.1.6)

4. Assessing the admitted students according to the university, we see that the tendency of students from outside the university to do M.Sc. in Swami

Ramanand Teerth Marathwada University is less. As per government rules in admission higher education 70% seats reserved for Home University students, 28% seats are for students from other universities in the same state. 2% seats are reserved for out-of-state and out-of-country students. Assessing the above percentage, it is seen that the percentage of students from outside the state and abroad is almost correct in percentage and the proportion of students from other universities in the state is less than 15%. (Table 3.1.5)

5. After observing last two points, we see that the participation rate in mathematics related actives like poster presentation, seminar competition, quiz competition and other mathematics related competitions is higher but the rate of getting rank or prize in this competition is only 30%. This shows that post graduate students in mathematics are more active in participating in mathematics related competitions.(Table 3.1.7 and 3.1.8)

4.2.Significant Results

1. There is statistically significant difference between gender and residence in admission process. (Table 3.2.1)
2. There is no statistically significant difference in participation in mathematics related activities between gender(Table 3.2.2)
3. There is no statistically significant difference in participation in mathematics related activities between residence. (Table 3.2.3)
4. There is statistically significant difference in gender between getting prizes/ranks in mathematics related activities. (Table 3.2.4)

5. There is no statistically significant difference in residence between getting prizes/ranks in mathematics related activities. (Table 3.2.5)
6. There is no statistically significant difference in mean test score in mathematical ability test between gender (Table 3.2.6)
7. There is statistically significant difference in mean test score in mathematical ability test between residence. (Table 3.2.7)
8. There is statistically significant difference in test score in mathematical abilities between gender.(Table 3.2.8)
9. There is no statistically significant difference in test score grade in mathematical abilities between residence (Table 3.2.9)
10. There is statistically significant difference in family monthly income between mathematical ability test(Table 3.2.10)
11. There is statistically significant difference in parents' occupation between mathematical ability test(Table 3.2.11)
12. There was no statistically significant difference in castes between gender with P value 0.512(Table 3.2.12)
13. There was no statistically significant difference in castes between residence with P value 0.306(Table 3.2.13)
14. There was no statistically significant difference in castes between mathematical abilities with P value 0.241(Table 3.2.14)

4.3.Recommendation

1. After observing table (3.2.1) there is statistically significant difference between gender and residence in admission process. We can guide to higher secondary students about available opportunities in Government as

well as private jobs and research in basic science stream specially mathematics subject. We can also promote to boys for choose basic science stream.

2. In this research we observe that there is statistically significant difference in gender between getting prizes/ranks in mathematics related activities. It means that percentage getting prize/ rank is more in male students than female students. If we motivate and encourage to female students about mathematics related activities than the ratio of getting prize/ranks between male and female students is near about same.

3. There is statistically significant difference in test score in mathematical abilities between gender. After observing table (3.2.8) there is variation between test score and gender. Fail percentage of male students more than female students in mathematical ability test because boys don't concentrate while teaching and studying. They are not serious about their grades; they take their studies lightly. We can encourage them by involving in mathematical activities and motivating them for their future.

4. There is statistically significant difference in Socio-economic between mathematical abilities(Table 3.2.10). after observing the table, we can analyze that, the students whose family income is below 20000 their failure percentage is higher than others, because they don't get much facilities and don't have favorable environment for their studies. If we can provide remedial classes and available library for 24×7 hours they may perform better in their studies.

5. There is statistically significant difference in parents' occupations between mathematical abilities. (Table 3.2.10). after observing the table, we can analyze that, the students whose parents' occupations is agriculture their children's failure percentage is high than others. Because they help their parents in farm works so they may don't get time to come to college and for their studies. We can assemble parents meeting for such students and explain them importance of education. Also, we can provide extra classes for those students.

4.4. Limitations of the Research

1. This research is limited to only Post Graduate Students.
2. This research is limited to Mathematics subject.
3. This research is limited to gender,residential and socio-economic approach to getting mathematical achievements.
4. This research is limited to Swami Ramanand Teerth Marathwada University region.

4. 5. Suggestions for Further Research

1. The research studied various factors which affect mathematics education. There are many other factors which can also be studied.

2. Similar research may be conducted on post graduate mathematics students studying in other universities in Maharashtra as well as India taking the same variables.

3. Similar research may be conducted on post graduate students studying in another subjects in Swami Ramanand Teerth Marathwada University, Nanded taking the same or another variable.
4. In this research our sample is small but we increase sample size like all post graduate mathematics students in India then we get most appropriate conclusion on gender differences and residence differences results.
5. Similar research may be conducted on secondary level, higher secondary level and degree level students taking the same variables.
6. Teachers as an important component of mathematics education need to be studied further. Studies may be conducted on special groups like gifted students, physically handicapped and first-generation learners Sources of difficulties in multi-step problems.