Jennifer E. V. Lloyd, John Walsh, and Manizheh Shehni Yailagh (2005). Sex Differences in Performance Attributions, Self-Efficacy, and Achievement in Mathematics: If I'm so Smart, Why Don't I Know It? In this study, we tested the claim that sex differences in mathematics achievement are related to boys' and girls' differing achievement-related beliefs. We compared the mathematics report card grades, 2001 Foundation Skills Assessment (FSA) Numeracy subtest scores, performance attributions, and self-efficacy of 161 British Columbian public school students (62 fourth-graders, 99 seventh-graders). Findings indicated that girls' mathematics achievement met or exceeded that of boys and that girls' attribution patterns were more self-enhancing than those found in previous studies. However, girls were more apt to display underconfidence relative to their actual mathematics achievement and to attribute mathematics failure to a lack of teachers' help than were boys.

2.2.3 Review related to the academic achievement of SCs and Non-SCs

ASER (2022) revealed that only 27% of rural Class VIII students in Odisha could solve basic division problems, with SC students disproportionately underperforming. NAS (2021) data showed SC students in Odisha scoring 15-20 points below the average in mathematics, demonstrating systemic disparities.

George (2011) carried out a study on higher education in India from the angle of exclusion of Scheduled Castes and Scheduled tribes. The study gives a detailed note on enrolment at higher education from social group perspective and explains reasons for exclusion of SCs/STs. The researcher also tried to find out the reasons for lower educational attainment of these groups.

Desai (1973) done a study on untouchables in rural Gujrat. Observation method was used to collect the data. Study revealed that untouchables earn their livelihood by clean activities and unclean activities. Clean activities involve cultivation and agricultural labour where as unclean activities involve removing the dead cattle. Out of 59 villages, in 35 villages, even in schools untouchable students do not have any relation with Savarna students.

Rao (1981) accomplished a study in Karnatka to examine the social change among SC through education. Census report and other secondary sources were used to collect the data. Results concluded increase in literacy rate of SC students from 1961 to 1971 due to reservation in schools and colleges, relaxation in age limits and lowering of eligibility marks in entrance for admission in various institutions. Study also added that education has improved the economic condition and social status of scheduled castes.

Verma (1990) attempted to find out whether significant differences existed among higher caste, backward caste and scheduled caste adolescent students in their cognitive ability,

academic achievement and study habits. 12th grade male adolescent students from different senior secondary schools of lakhimpur kheri (UP) were considered for study. Out of sample of 150 male adolescents, 50 belonged to higher castes, 50 from Backward Castes & 50 from Scheduled Castes. "Samanya Manasik Yogita Pariksha" by Joshi & "The study habits Inventory" by Krishnan were used to collect the data. Marks in intermediate exams were considered as the measure of academic achievement. Results concluded that higher caste students were better in scholastic achievement than Backward Castes & Scheduled Castes students.

Raina (1992) headed a study on Scheduled Castes & Scheduled Tribal students in rural India. Investigator selected the sample from village "Mota-fo Faliya" of vadodara district of Gujrat. Information Schedules were used to collect information from schools about enrolment and performance of Scheduled Castes & Scheduled Tribal students. Results concluded the increase in number of a Scheduled Castes & Scheduled Tribal students. Study also concluded that the academic performance of SC and ST students did not differ from other pupils.

Shukla and Aggarwal (1997) conducted a research to find out the differences between Scheduled Caste and Non- Scheduled Caste students in their socio-economic status, level of intelligence, self concept, occupational aspiration and academic achievement. Results concluded low socio-economic status of SC students than Non-SC students, no significant difference between SC and Non-SC in level of intelligence, low level of occupational aspiration of SC students than Non-SC students, lower level of academic achievement of SC students than Non-SC students.

Kinjaram (1998) in their study of academic achievement of scheduled caste students hailing from various sub-caste categories in relation to their socio-economic status in Telangana region of Andhra Pradesh, found that very few castes reach to university education level. While majority of the sub-castes do not reach the education upto S.S.C. Educational level of urban scheduled caste students is more than rural scheduled caste students with higher level of socio-economic condition reach to higher level of education.

Anand and Yadav (2006) conducted a study on the inclusion of SC girls in education. Investigators studied many policies and programmes for the improvement of overall status especially educational status of scheduled caste girls. Study revealed that majority of scheduled caste girls do not have any access to successful stage of education. Study also uncovered a bitter truth of high drop-out rate of scheduled caste girls. Investigators found that inclusion of scheduled caste girls and women in educational system is must to ensure development in all

aspects. They suggested to act upon many policies and programmes launched by government to increase literacy rate and to decrease drop-out rates of scheduled caste girls such as-

a) Pre-matric scholarships for children of those engaged in unclean occupations,

b) Sarva Shiksha Abhiyan,

c) Mid day meals,

d) Loans for economically needy students to persue education,

e) Operationalisation of universal elementary education particularly in SC dominated areas of low literacy rate.

Saini, M. (2016) accomplished a study to find the difference in academic achievement (in science) of high school students belonging to scheduled caste and non-scheduled caste categories. A sample of 284 students studying in IX class from district Mandi was chosen. Students belonging to general category, backward classes and scheduled tribe category were considered as non-scheduled caste students. Researcher personally collected the data. To measure the achievement in science, an achievement test (based upon seven selected chapters of science text book of IX class) was developed and standardized by investigator. Results concluded that scheduled caste and non-scheduled caste students do not differ significantly with regard to their academic achievement in science. Results also revealed that non-scheduled caste students have higher mean of academic achievement scores than scheduled caste students.

Dhende, L.D. (2017) explored a study of scheduled caste and higher education scenario in India. Study revealed that all the castes included under category of scheduled caste and especially women of scheduled caste category are not incorporated in the mainstream of higher education. Study cleared that the data about literacy and higher education enrolment among scheduled caste students in India is showing positive trend but the increase in gross enrolment ratio is gradual. Study also added that the enrolment in the higher education is lower as compared to primary and secondary level of education.

Navkiran and Paul, A. K. (2018) pursued a study on academic achievement among SC and Non-SC adolescents in relation to their emotional intelligence. A sample of 200 adolescents (100 scheduled and 100 non-scheduled castes) going to government senior secondary schools from four districts of state of Punjab was randomly taken. For emotional intelligence, data was collected by using emotional intelligence scale of Hyde et al and the scores gained in science subject in 10th class examination of PSEB were considered as the measure of academic achievement. Product moment method of correlation and t-test were used for data analysis. Results confirmed that non scheduled caste adolescents have better performance in academic achievement than scheduled caste adolescents.

Navkiran and Paul, A.K. (2018) conducted a research on academic achievement among SC and non-SC adolescents in relation to their family environment with a sample of 100 scheduled caste and non-scheduled caste adolescents. Sample was randomly chosen. Sample consists of students going to government senior secondary schools from four districts of state of Punjab. Marks obtained in science (out of 100) in matriculation examination of Punjab School Education Board were used as a measure of academic achievement and for family environment, data was collected by using family environment scale of Harpreet Bhatia and N. K. Chadha (revised 2012). Mean, standard deviation, product moment method of correlation and t-test were used for data analysis. Results concluded that non-scheduled caste adolescents are better in academic performance than scheduled caste adolescents. On the basis of above review of related literature, it becomes clear that not much work has been done to study the academic achievement of scheduled castes. **I.P.Desai (1973)** conditions of untouchables in Gujrat, Rao, **N.J. (1981)** role of education in social change of scheduled castes, **Ramaiah, K. (1998)** educational levels of scheduled castes, **Milky Roy Anand and Mona Yadav (2006)** a study of inclusion of SC girls in education indicated lower educational levels and higher drop-out rates of scheduled caste students. **L.D. Dhende (2017)** scheduled caste and higher education scenario in India also indicated lower enrolment of scheduled caste students in higher education. Where as in differential studies Verma, B. (1990) significant differences among higher castes, backward castes and scheduled caste adolescents in their cognitive ability, academic achievement and study habits, Shukla S.K. and Aggarwal, A. (1997) differences between SC and Non-SC students in relation to their socio-economic status, level of intelligence, self concept, occupational aspirations and academic achievement, Navkiran and A. K. Paul (2018) academic achievement among SC and non-SC adolescents regarding their EI, Navkiran and A. K. Paul (2018) academic achievement among SC and non-SC adolescents regarding their family environment revealed better scholastic achievement of Non-SC students than SC and ST students. On the other hand Raina (1992) study of SC and ST in rural India concluded no any difference of academic performance of SC and ST students from other pupils, also Manish Saini (2016) supported no any significant difference in academic performance of scheduled caste and non-scheduled caste students. Efforts by government to promote education for all: With the joint efforts of MHRD, government of India, department of school education and literacy and department of higher education, following schemes had been initiated at different levels of education-

A. Elementary education (upto 8th):

a) Mahila Samakhya Programme

b) Mid day meal to enhance enrolment, retention, attendance and to improve nutritional levels among children.

c) SSA (Sarva Shiksha Abhiyan)

d) IDMI (Infrastructure Development for Minority Institutes)

B. Secondary education (9th and 10th):

a) Adolescence education programme

b) Incentives to girls for secondary education

c) IEDSS (Inclusive Education for Disabled at Secondary Stage)

d) Model school scheme

e) NMMS (National Means Cum Merit Scholarship)

f) RMSA (Rashtriya Madhyamik Shiksha Abhiyan)

g) Vocationalisation of secondary education

C. Adult education

a) Saakshar Bharat Scheme 55

b) Jan Shikshan Sansthan Union budget 2018-19 proposed to consider school education holistically without any segregation from pre-nursery to class 12th. By combining three schemes, SSA, RMSA, and TE (Teacher Education), a new programme for school education is prepared i.e., Samagra Shiksha.

Efforts by the government for scheduled caste educational welfare in India

The following are some schemes initiated by the Ministry of Social Justice and Empowerment for the educational development of SC students:

A. Pre-Matric Scholarships

i) Pre-Matric scholarships to SC students to support their parents in educating their wards so that the dropout rate of SC students can be minimized.

ii) Pre-Matric scholarship to children of those who engaged in occupations involving cleaning and are prone to health hazards.

B. Post-Matric Scholarships

C. Scholarships for Higher Education

i) Top-class education of SC students to promote their qualitative education by providing financial support for studies beyond the 12th class.

ii) National fellowship to assist SC students to pursue higher studies like M.Phil and PhD

iii) National overseas scholarship to assist SC students to pursue master's level courses and PhD programmes abroad.

iv) Free coaching for SC and OBC students for competitive examinations.

2.2.4 Review related to parental socio-economic status and students' mathematics achievement

A study conducted in the Sirsa district (Academia.edu, 2018) found SC students scored 22% lower in mathematics than their peers. Factors such as discrimination, lack of access to private tuition, and limited home support were highlighted as contributing reasons. Bandura's (1994) self-efficacy theory supports the idea that low confidence, shaped by social stigma, adversely affects SC students' learning outcomes.

The Socio-Economic Status (SES) of the students are directly identified with the socio-economic status of the parents. According to Jeynes (2002), parental education, occupation and family income determine the students' socio-economic status. Peard (2002) studied on socio socioeconomic conditions and students' academic achievement in Mathematics. The findings of the research revealed that the socio-economic environment exerted a strong and significant effect on school students' Mathematics achievement. As such, parental socio-economic status is significant in the child's educational achievements. Research findings show that parents with higher socioeconomic background tend to be more in their children's education than the parents of lower socioeconomic status. Epstein (1987) observed that more involvement fosters more positive attitudes towards learning, which results in better academic achievement. Pitiyanuwat and Campbell (1994) reported that family support had positive effects on Mathematics achievement, but excessive pressure and help had negative effects on students' academic performances. It was found in the study that a mix of socio-economic status, family structure variables, and family processes had strong effects on children's overall academic achievement, self-concepts, and Mathematics achievement.

While exploring the causes and remedies of dropout of middle school students by administering a multi-level analysis, Rumberger (1995) found that socio-economic condition was the most significant important contributor to students' academic achievement.

Yelkpieri (2016) examined the effect of parents' socio-economic status on students' academic achievements and found that parents' financial condition is significantly correlated to students' academic achievement while the home environment provided for students learning was significantly correlated to students' academic achievement. In a study on the effects of parents' educational background, parents' socio-economic status and school location on students' academic achievement, Joseph et al. (2018) found parents' educational background not to be a predictor of students' academic achievement. However, parents' socio-economic conditions were positively correlated to students' academic achievement in basic sciences while the school location was a predictor of students' academic achievement in basic sciences.

Patel (2012) studied the impact of psycho-social factors including socio-economic status (SES) on Mathematics achievement of Class-IX students and found a significant effect of caste, intelligence and SES on their Mathematics achievement. However, there was no significant effect of gender, school type and area on their achievement in Mathematics.

Rajput (1984) investigated the effect of students' intelligence level, educational encouragement and socio economic status on Mathematics achievement of the students. The findings showed that the socio-economic condition was positively and significantly correlated to students' achievement in Mathematics.

Alam (2009) conducted a study to assess the relation between creativity and socio economic status of Class IX students and their academic achievement in different government schools of Darbhanga and Madhabani districts of Bihar, India. The results showed a positive correlation between the creativity of the students and their academic achievement. Likewise, a positive correlation existed between the students' socio-economic status and their academic achievement.

In a study conducted in Indian city of Lucknow, **Chandra and Azimuddin (2013)** found a significant difference between students of high and medium socio-economic status in terms of academic achievement. Students with medium socio-economic status had lower academic achievement than the students with high socio-economic status.

Sankaran (1979) conducted a study to examine the relationship between socio economic status and science achievement of secondary school students studying in Kerala. The results indicated that the socio-economic status and students' academic achievement in science was positively correlated while it was significant for girls but was insignificant for male students. The researcher also found that the relationship between socio-economic status and achievement in science was positive but it was not significant for the students who studied in schools located in rural areas.

2.2.5 Review of Influence of Teaching Methods

Shaikh (2015) found that students taught using inquiry-based methods performed significantly better in geometry than those taught through traditional methods. Bruner's (1960) constructivist theory also emphasizes learning through discovery, while Vygotsky (1978) advocates for social learning environments to enhance comprehension.

Despite these theoretical recommendations, ASER (2022) shows that 70% of rural classrooms still use rote learning, particularly in SC-dominated areas. This mismatch between recommended practices and classroom realities has a direct impact on learning outcomes.

2.2.6 Review of School Environment and Infrastructure

Infrastructure plays a significant role in mathematics learning. UDISE+ (2022) reports that 80% of schools in Khurdha's SC-majority areas lack computer facilities and adequate teaching aids. A positive learning environment, as emphasized by Crow & Crow (1963), significantly improves academic performance. Lack of electricity, sanitation, and overcrowded classrooms contribute to lower achievement levels.

2.6.0 SUMMARY

The literature review highlights several consistent themes: SC students face systemic disadvantages in mathematics due to social, economic, and educational barriers. Gender biases further marginalize SC girls in academic performance.Student-centered teaching methods are more effective but are rarely implemented in SC-majority schools. Infrastructure deficiencies and inadequate teacher training hinder effective mathematics teaching. This review identifies a critical gap in localized, empirical research focused specifically on SC students in Khurdha district. The present study seeks to fill this gap by assessing their current achievement levels in mathematics, identifying influencing factors, and suggesting remedial strategies aligned with ground realities.

CHAPTER -III

METHODOLOGY

CHAPTER –III

METHODOLOGY

3.1.0 INTRODUCTION

The methodology chapter outlines the research design, sampling procedures, tools used for data collection, and the techniques employed for data analysis. It serves as a blueprint that guides the entire research process and ensures that the study is scientifically grounded and systematically conducted.

3.2.0 METHODOLOGY

Descriptive survey method was used for the study. The method is best used for studies related to education that are concerned with understanding present conditions, practices, and attitudes. A descriptive survey method is being adopted to gather quantitative as well as qualitative data from representative samples to assess the current state of mathematics achievement in Class VIII Scheduled Caste (SC) students and to further explore the factors influencing their performance. In the first step, each student received a questionnaire that included socio-economic status and parental occupation. In the second step, questionnaires were given to the teachers to gather information regarding school resources and teaching quality.

3.3.0 POPULATION AND SAMPLE

The following section presents the details of the population and the sample selected for the study.

3.3.1 POPULATION

The population of this study comprises all Class VIII students belonging to both Scheduled Caste and Non-Scheduled Caste categories who are enrolled in government schools of Khurdha district, Odisha, along with the mathematics teachers teaching in these schools.

3.3.2 SAMPLE

Random sampling technique was employed for the study. A total of ten government middle schools from Khurdha district, Odisha, were selected. Since the focus of the study was on middle school students and their mathematics teachers, the final sample included 200 students—comprising 60 Scheduled Caste (SC) and 140 Non-Scheduled Caste (Non-SC) students—along with 22 mathematics teachers. A detailed description of the sample is presented in Table 3.1.

Table-3.1: School-wise and Category-wise Students and Teachers

SL NO	LIST OF SCHOOLS	STUDENTS (N)		TEACHERS (N)
		SCs	Non-SCs	
1	KAPILPRASAD U G U P S	6	14	2
2	BAPUJINAGAR U G U P S, BHUBANESWAR	6	14	3
3	PANDIT RAGHUNATH GOVT UP SCHOOL, MULAPADIA	6	14	2
4	NARAGODA TAMANDO NODAL U.P. SCHOOL, TAMANDO	6	14	2
5	SAHANI KASIPUR PROJECT UP SCHOOL, KASIPUR	6	14	2
6	TIRIMAL NODAL U P SCHOOL, TIRIMAL	6	14	2
7	BISIAPADA UPPER PRIMARY SCHOOL, BISIAPADA	6	14	2
8	BENAPANJARI UGUPS,BENAPANJARI	6	14	2
9	DAKSHINAKALI U P S, NIRANJANPUR	6	14	2
10	ANCHALIKA VIKASH PARISHAD VIDYAMANDIR, NANDAPUR	6	14	3

3.3.0 VARIABLES OF THE STUDY

There are two types of variables in this study.

1. Independent variable
2. Dependent variable

3.3.1 Independent Variable

Socio-economic status, school infrastructure, quality of teaching, and parental occupation.

3.3.2 Dependent Variable

Achievement in mathematics among SC students.

3.4.0 TOOLS AND TECHNIQUES

To collect valid and reliable data, the following tools were used:

Mathematics Achievement Records: Academic performance data in mathematics will be collected from school records.

Questionnaire for Students: A structured questionnaire will be administered to students to understand their socio-economic status and parental occupation.

Questionnaire for Teachers: A structured questionnaire will be administered to mathematics teachers to understand their teaching methods, challenges faced, and perceptions about SC students.

Classroom Observation Schedule: Non-participant classroom observations will be conducted using a structured observation schedule to record instructional strategies, classroom environment, and student participation.

3.5.0 PROCEDURE OF DATA COLLECTION

1) Permission and Access: Necessary permissions will be sought from the Block Education Officer (BEO) and the headmasters of selected schools.
2) School Visits: The researcher will visit each school and collect academic performance data from school records.
3) Administering Tools: The questionnaire will be distributed to mathematics teachers. Classroom observations will be scheduled during regular math periods.
4) Data Recording: Observations and responses will be recorded systematically to ensure objectivity and consistency.

3.6.0 STATISTICAL TECHNIQUES USED FOR DATA ANALYSIS

Quantitative data will be analyzed using the following statistical techniques:

1) Percentage Analysis: To determine the proportion of students achieving different performance levels.
2) Mean and Standard Deviation (SD): To understand central tendency and dispersion in scores.
3) Percentiles: To assess the relative standing of individual student performance.
4) Qualitative data from teacher questionnaires and classroom observations will be analyzed thematically to draw meaningful interpretations about instructional practices and challenges.

3.7.0 ETHICAL CONSIDERATIONS

Participation will be voluntary, and informed consent will be obtained from both students and teachers. Anonymity and confidentiality will be maintained throughout the research. The data collected will be used solely for academic and research purposes.

CHAPTER - IV

DATA ANALYSIS & INTERPRETATION

CHAPTER - IV

DATA ANALYSIS AND INTERPRETATION

4.1.0 INTRODUCTION

Chapter- I comprises the introduction, background of the study, justification, and need of the present research along with objectives, hypotheses, and delimitations. The related literature has been reviewed in Chapter- II. Methodology applied in this study and in detail; statistical techniques used have been elaborated in the previous chapter. This chapter deals with the analysis of data, interpretation of the results, and the findings of data collected from Class VIII Scheduled Caste (SC) students of government schools in Khurdha district, Odisha. Below, objective-wise analysis of data and interpretations of results are presented under separate captions. . The purpose of the analysis is to assess the level of achievement in mathematics and identify the patterns and factors that influence their performance.

4.1.0 OVERVIEW OF DATA COLLECTED

Data were gathered from ten government schools through academic records, teacher questionnaires, and classroom observation schedules. All in all, 200 SC students were taken as a sample. Mathematics scores of annual school-level assessments for the 2023-24 Academic Year were used for quantitative analysis.

4.2.0 ACHIEVEMENT IN MATHEMATICS

The first objective of the present research was to assess the level of achievement in mathematics of class VIII students. The mathematics scores of the students were analyzed using descriptive statistical techniques, such as Mean, SD, and Percentiles.

Table - 4.1: Mean, SD and Percentiles of Achievement Scores of SC & Non-SC Students

NO OF STUDENTS	CATEGORY	MEAN	SD	PERCENTILES				
				P25	P50	P75	P90	P95
60	SC	64.28	20.73	44.75	66.5	83	88	94.05
140	NON-SC	70.96	16.21	59	75	83.25	90	95
200	TOTAL	68.96	17.90	54.75	74	83	89	95

From Table 4.1, it is evident that the mean scores of Achievements in Mathematics of SC students are 64.28. Standard Deviation of Achievement in Mathematics is 20.73. Further, more than 50% students secured above 66.5% marks. 25% students scored more than 83% marks in mathematics. 10% of students scored more than 88% marks in mathematics. 5% of students scored more than 94.05% marks in mathematics. The average score of Achievements in