Patterns of specific learning disorder and comorbid psychiatric disorders among children at the child psychiatry clinic of Kenyatta National Referral Hospital, Kenya

By

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DECLARATION OF ORIGINALITY

I, Dr Florence Mlongo Mbandi hereby declare that this is my original work carried out in partial fulfilment of the award of master's degree of medicine in psychiatry at the University of Nairobi. It has not been submitted for an academic award or qualification in any other institution of higher learning for any award. Appropriate referencing has been done when citation of other people's work has been made.

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APPROVAL

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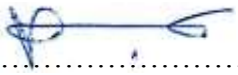
   Signature  Date …15/08/2022……

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I would like to express my earnest gratitude to my supervisors, Dr. Mbwayo and Dr Gitau who guided me in the research.

DEDICATION

I dedicate this research to my family and friends. Special appreciation to my dear husband Joram for being very helpful and supportive in this work.

LIST OF ABBREVIATIONS

ADHD	-	Attention Deficit Hyperactive Disorder
APA	-	American Psychiatric Association
CD	-	Conduct Disorder
EARC	-	Education Assessment Resource Centre
DSM-IV	-	Diagnostic and Statistical Manual of Mental Disorders 4^{TH} Edition
DSM-V	-	Diagnostic and Statistical Manual of Mental Disorders 5^{TH} Edition
ICD-10	-	International Classification of Diseases, Tenth Revision,
IQ	-	Intelligent Quotient
IQR	-	Interquartile range
KISE	-	Kenya Institute of Special Education
KNH	-	Kenyatta National Hospital
KNH-UoN ERC	-	Kenyatta National Hospital University of Nairobi Ethics and Research Committee
KNH A&E	-	KNH Accident and Emergency
KNH PGC	-	KNH Paediatric Gastroenterology Clinic
KNH PNC	-	KNH Paediatric Neurology Clinic
KNH OT	-	KNH Occupational Therapy Clinic
KNH POPC	-	KNH Paediatric Outpatient Clinic
KNH SOPC	-	KNH Surgical Outpatient Clinic
KNSNESR	-	Kenya National Special Needs Education Survey
MDD	-	Major Depressive Disorder
Mmed	-	Master of medicine
ODD	-	Oppositional Defiant Disorder

OP - Outpatient

SD - Standard Deviation

SLD - Specific Learning Disorder

SPSS - Statistical Package for the Social Sciences

OPERATIONAL DEFINITION OF TERMS AND PHRASES

Comorbidity- presence of more than one disorder co-occurring with a primary condition

Co- occurring Disorders- a primary disorder that leads to occurrence of another disorder

Inpatients – patients that are receiving treatment while admitted in the hospital ward.

Outpatients –patients that receive their treatment in a clinic and go home they do not stay overnight at the hospital premises.

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ABSTRACT

Introduction: Many mental illnesses coexist with Specific Learning Disorder (SLD), as is widely acknowledged around the world. The presence of these psychiatric conditions in children with SLD worsens their clinical image and has an effect on their learning disability prognosis. In the Kenyan context, there is a scarcity of literature on comorbid conditions in learning disabilities.

Aim: The aim of this study was to examine specific learning disorder and comorbid psychiatric disorders among patients who attended child psychiatry clinic at Kenyatta National Hospital between 1st January 2019 and 31st December 2019**.**

Methodology: This was a descriptive retrospective study where clinical records of 256 patients between the age of 7 to 12 years, were reviewed. Out of the 256 patient files, thirty-five 35 were found to have a diagnosis of SLD. Data collection and analysis was done from the 35 patients files for the study. A data tool designed by the researcher was used to collect data.

Data analysis: Data was entered into RedcaP then transported to MS Excel. Analysis was done using SPSS version 27. For discrete variables, frequency tables were provided, while for continuous data, means and standard deviations were provided. Pearson Chi-square and fishers exact test were used to analyse the associations between variables. For variables with cell numbers less than 5 fishers exact test was used. Statistical significance thresholds were set at $p < 0.05$.

Results: Thirty-five 35 (13.7%) of the patients' files were found to have a diagnosis of SLD. The mean age was 9.31 years. Dyslexia and dysgraphia were diagnosed in 11.7%, 6.3% of the cases respectively. Dyscalculia was diagnosed only as combined type in 2.9% of the cases. The study found that, SLD was more among boys than girls at the ratio of 4:1. Psychiatric comorbidities were diagnosed in 82.3% of cases with SLD. ADHD was the most common diagnosed psychiatric comorbidity, it accounted for 40% of the cases. In this study; family history of SLD, neonatal complications, delayed milestones, post-natal complications, parental level of education and parental occupation did not reach significant statistical difference with SLD. Maternal age and dyslexia, conduct disorder and dysgraphia, conduct disorder and dyslexia and conversion disorder and dyscalculia reached a significant statistical difference.

Conclusion: This study found out that;

1. SLD was diagnosed more in boys than girls.
2. The comorbidity numbers diagnoses between SLD and other psychiatric illnesses was high.
3. Therefore, there is need to explore comorbidity in all the children who attend the child psychiatric clinic at KNH with problems in their studies for proper diagnosis and management.

1. INTRODUCTION

1.1. Background information

SLD is a neurodevelopmental condition. It is failure to meet approved grade-level expectations in listening comprehension, written language, basic reading skills, reading fluency skills, reading comprehension, mathematics calculation, and/or mathematics problem-solving despite age-appropriate learning opportunities and instruction, as described in the DSM V. ICD‐10 describes them as "specific developmental disorders of scholastic skills" and DSM‐IV as "learning disorders" and DSM‐5 as "specific learning disorder". It involves impairment in the three academic domains and their subskills. These are:

Impairment in reading also known as dysgraphia the sub skills in this impairment are

reading speed or fluency, reading comprehension, word reading accuracy. Second, is impairment in written expression also known as dyslexia. Sub skills here includes grammar and punctuation accuracy, clarity or organization of written expression, and spelling accuracy.

Third is Impairment in mathematics also known as dyscalculia, with sub skills including memorization of arithmetic facts, accurate or fluent calculation, accurate mathematic reasoning number sense (Hidalgo Vicario and Rodríguez Hernández, 2013)

In dyslexia, despite sufficient schooling, intellect, sociocultural resources, and no apparent sensory deficiencies, the patient has difficulty learning to read and spell (Gilger and Kaplan, 2001). The phonological comprehension deficiency is the core problem in dyslexia.

In dysgraphia, the person's writing abilities are below what would be required for his or her age and cognitive level. Depending on the age of presentation, as neurodevelopment progresses, and academic aspirations rise, it can manifest in a number of ways. As a disorder

of written expression, it affects handwriting, spelling, and higher-order organizational skills at one or more stages of writing.

Children with dysgraphia in preschool can exhibit the following characteristics. (Kushki *et al.*, 2011): An uncomfortable writing grip or body posture, writing fatigue, avoidance of writing and drawing activities, difficulty remaining within margins and badly shaped, inversed, reversed, or inconsistently spaced written letters

A school-aged child with dysgraphia can exhibit the following characteristics in addition to the ones mentioned above. Difficulties with word finding, sentence completion, and written comprehension, illegible handwriting and switching between cursive and print (Kushki *et al.*, 2011).

Finally, dysgraphia can cause difficulty organizing thoughts in writing as well difficulty with written syntax and grammar that isn't duplicated in oral activities among teenagers and young adults. (Kushki *et al.*, 2011):

Writing is a talent that is learnt in early life and is essential for learning and daily activities, especially as academic and environmental demands increase with age. Despite the fact that dysgraphia and disorders of written expression are fairly common in children, the school and family of the affected person may make mistakes or miss them. (Chung and Patel, 2015)

Dyscalculia is a long-term impairment in acquiring normal arithmetical skills that occurs when a specialized capacity fails to develop correctly, leading to negative consequences in developmening higher-level math skills. This is characterized by the main mental functions impairment in the sense of numerosity, sense of the number of items in a set which results in terrible performance on very basic tasks like counting small numbers of dots and comparing numerical magnitudes. (Reigosa-Crespo *et al.*, 2012). These deficiencies are long-term and greatly impede learning, occupational, and everyday activities. (Moll *et al.*, 2014)

Neurodevelopmental conditions (e.g., ADHD, Communication disorders, developmental control disorder, autism spectrum disorder) or other psychiatric disorders (e.g., anxiety disorders, depressive and bipolar disorders) commonly co-occur with specific learning disorder(Hidalgo Vicario and Rodríguez Hernández, 2013). SLD is associated with the comorbidities, either as a result of the condition or as a direct result of the same deficits caused by an initial insult. These issues create a vicious cycle in which the child's cognitive and social-emotional abilities deteriorate.

Specific Learning Disorder is one of the most commonly diagnosed childhood developmental disabilities. Eighty percent of those with SLD have dyslexia.Combined types of SLD occur more frequently than standalone types (Moll *et al.*, 2014). Dysgraphia may occur alone or in combination with other learning disabilities, and it is often misdiagnosed. Dyscalculia occurs frequently in a half of children with dyslexia.

SLD may be caused by a variety of factors, including genetic predisposition, developmental and cognitive factors, spoken language, and environmental factors. Sex, intelligence, a higher family history of learning difficulties, low parental education, prenatal exposure to drugs, radiation, smoking, infections, complications during childbirth, premature labor, low birth weight, low Apgar score, neonatal jaundice, developmental delay, convulsions, low income families, and low socioeconomic status are all risk factors for SLD (MacKay *et al.*, 2013). If a parent has trouble reading, there is a substantial chance that the child may have a reading impairment (Vogler, DeFries and Decker, 1985).

1.1.1 SLD association with other psychiatric disorders

Psychiatric disorders are very common in children with SLD. In 50 percent of children with SLD, comorbidity is reported. (Beitchman *et al.*, 1998). ADHD, conduct disorder, oppositional defiant disorder, anxiety disorder, and depression are the most common comorbidities,

according to studies (Hidalgo Vicario and Rodríguez Hernández, 2013). Other disorders like communication disorders, developmental coordination disorder, autistic spectrum disorder and bipolar disorder are least common to co-occur with SLD. The comorbidity rate is higher in the male gender; McGee et al., 1986, found that boys with impairment in reading were three times more likely than their counterparts to have ADHD, conduct disorder, or oppositional defiant disorder (ODD).

ADHD co- occurs commonly with reading disabilities (Biederman, Newcorn and Sprich, 1991). Hooper and Williams in their study; learning disabilities and ADHD found that, Inattentiveness and reading difficulties have a close link. They also documented that, SLD children have increased rates of hyperactivity. In SLD youngsters, rates of comorbid ADHD range from 10% to 60%.(Karande *et al.*, 2007). Children with SLD are five times more likely to have conduct disorder (CD).This has been associated with learning disability personality characteristics that predispose the individual to CD(Gordon, 1993).

Children with Major Depressive Disorder (MDD) have been found to have a three‐fold increase in developing SLD. It was documented to be as a result of three potential relationships that were hypothesized in a review on co‐morbid depression and learning disability: Learning disorders trigger or worsen depression, depression causes or exacerbates learning disabilities, or a particular brain disorder contributes to both MDD and SLD in certain children (Fristad, Topolosky and Weller, 1992).

Studies have documented that students with SLD see classroom tests as a substantial threat, thus increases their test anxiety (von der Embse *et al.*, 2014). Students with SLD experience more difficulties in evaluative situations than students without SLD. The anxiety was reported to be higher in females than males on self‐report measures test. It was associated with females willingness to admit to anxiety.(Danthony, Mascret and Cury, 2020)

1.2 Problem statement

An estimated 5% to15% of school age children globally struggle with learning disabilities. It has been documented as the highest diagnosed neurodevelopmental disorder in childhood(Hidalgo Vicario and Rodríguez Hernández, 2013). Fifty percent of these children with SLD have a comorbid psychiatric disorder. The co-occurrence of these psychiatric disorders in children with SLD aggravates the clinical picture and greatly affects the prognosis of their learning disability problem. Unfortunately, there was paucity of data in our setting on SLD and comorbid psychiatric disorders. The majority of these children with this problem have not been identified in Kenya; they are referred to as "unteachable," "hard to teach," "lazy," "slow learners," "difficult," "daydreamers," "careless," "stupid," or "foolish" in regular schools. These disorders if not recognized and managed, produce higher psychological anguish, lower general mental health, school dropout, and unemployment/underemployment later in life for the affected individual; problems which are beyond just having lower academic achievement. Therefore, there was need to establish the burden of SLD and psychiatric comorbidities to enable sufficient planning for the special needs of this group of children.

2. LITERATURE REVIEW

2.1. Overall Pattern of Specific learning disorder

The estimates of SLD varies between 5% and 15% (Hidalgo Vicario and Rodríguez Hernández, 2013). In India, SLD was 12.5%, according to the National Institute of Mental Health and Neurosciences(NIMHANS), there were no major variations in prevalence rates between urban middle class, slum, and rural areas (Srinath *et al.*, 2005). SLD was 15.17 percent in another study conducted in south India, with 12.5 percent, 11.2 percent, and 10.5 percent having dysgraphia, dyslexia, and dyscalculia, respectively (Mogasale *et al.*, 2012).

Despite the fact that some studies have found no major gender differences in reading disability, others have found that SLD is more common in boys(Hidalgo Vicario and Rodríguez Hernández, 2013).

In Tunisia, SLD was found to be prevalent in 32 percent of the study population, resulting in a population prevalence of 6.4 percent. Most common SLD was dyslexia and dyscalculia. The majority of children with SLD originated from low-income families. (Missaoui, Gaddour and Gaha, 2014)

2.2. Diagnosis

A clinical analysis of the individual's developmental, medical, educational, and family background, as well as test scores and teacher findings and reaction to academic interventions, is used to make the diagnosis of SLD. Furthermore, present academic abilities must be substantially below the expected range of scores based on the person's chronological age (e.g., at least 1.5 standard deviations below the population mean for age) and age-appropriate education in culturally and linguistically appropriate reading, writing, and/or mathematics with normal levels of intellect functioning. (Hidalgo Vicario and Rodríguez Hernández, 2013).

2.3. Specific Learning Disorder academic domains

The academic domains are reading, written expression, and mathematics. A child develops problems in learning and applying academic skills in these three academic domains. DSM‑IV describes them as "disorders of reading, written expression or mathematics". DSM-V has classified them all under one category as "Specific learning disorder with impairment in reading, written expression or mathematics that is dyslexia, dysgraphia or dyscalculia respectively(Hidalgo Vicario and Rodríguez Hernández, 2013). A child may present with one impairment, two or all the three. Combined types of SLD occur more frequently than standalone types (Moll *et al.*, 2014). Individual prevalence of dyslexia, dysgraphia, and dyscalculia was found to be 11.2 percent, 12.5 percent, and 10.5 percent, respectively, in an Indian report. (Patil and Patil, 2016)

2.3.1. Dyslexia

Dyslexia and possible dyslexia were found to be prevalent in 6.3 and 12.6 percent of the population, respectively. The male to female dyslexia ratio was 3.4:1. (Patil and Patil, 2016). In another study in Mysore, India, the average prevalence of dyslexia was found to be 13.67 percent among 400 students. Dyslexia was found to be prevalent in 19.00 percent of males and 8.50 percent of females as compared by gender. (Rao *et al.*, 2017)

2.3.2. Dyscalculia

Individual differences in later mathematical achievement are predicted by basic numerical abilities, according to evidence from typical development. Severe low achievers have been shown to perform differently on tasks of number comparison and counting compared with typically developing children (LeFevre *et al.*, 2006). The prevalence of dyscalculia was estimated to be 3.4 percent, with a male to female ratio of 4:1 (Reigosa-Crespo *et al.*, 2012).

2.3.3. Dysgraphia

Writing is a crucial and difficult skill that develops in early childhood. Dysgraphia can manifest itself in a variety of ways, including illegibility of letters, a slow rate of writing, trouble spelling, and syntax and composition issues.(Chung and Patel, 2015). The prevalence for developmental writing disorders is about 7–15% among school-age with boys being more affected than girls (Floden, A, Combs, 2012).

2.4. Behavioural and Emotional Problems of children with SLD

SLD is frequently stigmatized and associated with failure, resulting in low self-esteem in children. (Swanson and Stomel, 2012). Problems at school in reading, arithmetic, logic, memory, and/or self-control problems that a learning-disabled child can encounter may be a cause of annoyance all the time. Many children with learning disabilities face social rejection and are bullied by their peers. Individuals with learning difficulties, in contrast to their counterparts who do not have a learning disability, acquire a negative self-perception of themselves, according to research. There is literature linking depressive tendencies, negative self-perceptions, low self-esteem, or emotional and behavioural disorders and suicidal behaviour of those who have a learning disability (Ebru Ikiza and Cakarb, 2010). A child with a learning disability faces significant learning challenges and academic difficulties, and should receive specialized aid in education. There is a discrepancy between potential and achievement. Children with learning difficulties have an average or above-average IQ, but they frequently struggle to achieve the same academic level as their peers. (Giaouri *et al.*, 2020).

2.5. Specific Learning Disorder and psychiatric disorders

Several studies have been conducted on SLD and comorbid psychiatric disorders.

In a study in Ohio State University, SLD was found to be 7 times more common compared to community-based rates in 30 inpatient children aged 6–12 years with MDD. (33 percent vs. 4.7 percent) (Fristad, Topolosky and Weller, 1992).

In another study it was recorded that, the most common comorbidity among children who struggled with math was phobic condition or anxiety in (30%) of the cases(Hooper and Williams,). A phobia or anxiety disorder was found in 24 percent of youngsters with both spelling and numeracy problems.

In yet another study in Italy, in 62.2 percent of the overall study, SLD co-occurred with neuropsychiatric disorders. ADHD was present in 33% of the patients, while Anxiety disorder was present in 28.8%, Developmental Coordination Disorder was present in 17.8%, Language Disorder was present in 11%, and Mood Disorder was present in 9.4%. Males had higher rates of comorbidity than females (Margari *et al.*, 2013).

Somale et al., 2016, out of 100 cases of SLD in school going children, 39% had no comorbidities, 54% had neurodevelopmental comorbidities, 7% had other comorbidities. The commonest comorbidity was ADHD, in 53% cases. Autism was noted in 3% cases while epilepsy and cerebral palsy were noted in 2% cases each. The ratio of males to females was 2.2:1.

In a cross-sectional analysis on SLD and psychiatric comorbidities conducted in two schools in South India, the overall prevalence of SLD cases was 6.6 percent. The most common comorbidity associated with SLD was found to be ADHD, which accounted for 41.9 percent of cases with inattentive subtypes. The prevalence of conduct disorder was 3%, with a tendency toward disobedience symptoms. Emotional disorders were 6.3%. The male: female ratio was 1.8:1(Bandla, Mandadi and Bhogaraju, 2017).

L *et al.*, 2018 in Tunisia, conducted a cross-sectional, descriptive, comparative and analytical study, involving 49 students with specific learning disorder. In 51.02 percent of the cases, there was psychiatric comorbidity. Anxiety disorders were 38.85% of the cases, elimination disorders 30.61%, language disorders 28.57%, ADHD 18.36%, major depressive episode 8.1%, oppositional defiant disorder 6.1%, and tic disorder 4.08% of the cases. The male: female ratio was 2:1, indicating male predominance. According to the findings, even if an SLD did not exist at the time of the initial examination, it predisposes youngsters to a subsequent psychiatric disease. Hence, emotional or behavioural disorders can conceal an SLD. Thus, in assessing and managing SLD, the physician must be watchful.

2.6. Justification of the study

Specific learning disorder and comorbid psychiatric disorders was prevalent in other parts of the world. Unfortunately, little was known about this problem in Kenya, and even less from the representative main child psychiatric clinic at Kenyatta National Hospital, which was a referral clinic serving many counties, hence we could not provide the necessary information needed at the Ministry of Health and at the Ministry of Education for policy making to support this group of children.

Thus, contemporary data was needed to determine the patterns of SLD and psychiatry comorbidities, and this study was to identify the burden at Kenyatta National hospital child psychiatric clinic.

Precise knowledge regarding the patterns of SLD and psychiatric comorbidities would enable the determination of the extent of this burden, the delineation of risk factors in children with these disorders and identification of these disorders would help make rational decisions about provision of the necessary medical and educational needs for this group of children. This

study was also a basis for further investigations into causative factors, and impact the of these disorders among patients and their families.

2.7. Significance of the research

This study provided data on the patterns SLD and psychiatric comorbidities among the patients receiving medical care at child psychiatric clinic. This data informs policy making to address the special medical and educational needs in this group of children. In addition, this study formed the basis for future studies such as community or education setting surveys to assess the burden of specific learning disorder and psychiatric comorbidities.

2.8. Research Objectives

2.8.1. Broad objectives

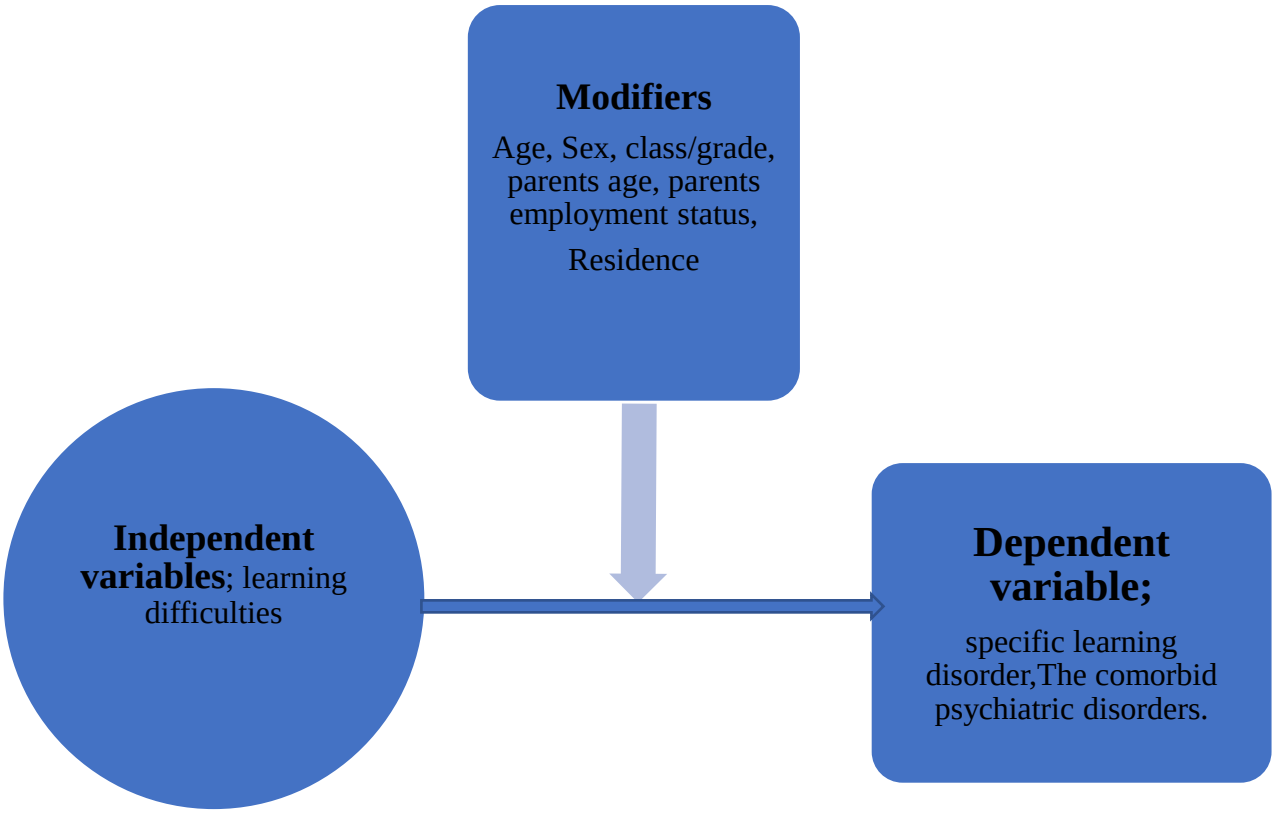
Determined the patterns of specific learning disorder and psychiatric comorbidities among the patients who had attended the child psychiatric clinic at KNH and their socio-demographic characteristics.

2.8.2. Specific objectives

1. Described the patterns of specific learning disorder among the children who had attended child psychiatric clinic at KNH in 2019.
2. Described the three domains of specific learning disorder.
3. Described the differential distribution of the various psychiatric comorbidities across SLD.
4. Described the socio-demographic characteristics of the patients with specific learning disorder, comorbid psychiatric illnesses.

2.9. Conceptual framework

Framework depicted the causal relationship between the independent and dependent variables. The arrow from intervening variable indicated a relationship with the dependent variable.



3. METHODOLOGY

3.1 Study design

This was a retrospective descriptive study.

3.2 Study area description

The research was carried out at Kenyatta National Hospital (KNH), Mental Health Department, and Records Department which is situated in Nairobi County, the capital city of Kenya. The Kenya National Hospital is the country's largest national referral centre and a teaching hospital affiliated with the University of Nairobi College of Health Sciences. It is the oldest hospital in Kenya, founded in 1901, has 1800 bed capacity and has over 6000 staff members. It has a total area of 45.7 hectares with a big range of services delivered. Catchment population is mainly composed of people of low and medium socioeconomic status. Mental health department and Records Department are departments in the national hospital. It is one of the main specialist mental health services providers in the country

The department provides outpatient mental health services for all mental health disorders and inpatient psychiatric reviews in all the wards. The team members include 6 consultant psychiatrists, 3 clinical psychologists, Mmed internal medicine students, Mmed psychiatry students, Mmed paediatrics and child health students and clinical psychology students.

This team runs 4 outpatient clinics a week:

1. Adult psychiatry clinics, the average number of patients seen in each clinic is 40.
2. Child psychiatry clinics, the average number of patients seen in each clinic is 7.
3. Youth centre, the average number of patients seen in each clinic is 30.
4. Psychology clinic, the average number of patients seen in each clinic is 15.

The department provides curative and a variety of services to the patients. The majority of the children seen at this facility are referrals from several hospitals from different counties and from Kenya Institute of Special Education (KISE).

3.3 Study Population

The study population were the patients treated at child psychiatric clinic at KNH in 2019 who were between 7 and 12 years old.

Inclusion criteria

i. The study included children between 7 years and 12 years treated in 2019.
ii. Those with a specific learning disorder diagnosis with or without other psychiatric comorbidity diagnosis.

Exclusion criteria

i. Incomplete clinical records
ii. Missing patients' files

3.4. Sample size

All files of patients between 7 and 12 years treated at child psychiatric clinic at KNH in 2019 were reviewed.

3.5. Sampling procedure

There was no sampling procedure employed since all files of patients who were between 7 years and 12 years treated at child psychiatric clinic at KNH in 2019 were reviewed. Files were obtained from the Kenyatta national hospital health records department after obtaining an authorization letter from the Kenyatta National Hospital Research Office. Permission to

access medical records was also obtained from the KNH Mental Health Department, as well as from the Records Department.

3.6 Variables

Dependent variables were specific learning disorder and comorbid psychiatric disorders. The independent variable was the patients between 7-14 years old who attended child psychiatry clinic with learning difficulties. The intervening variable were the socio-demographic characteristics; that is age, sex, grade, residence, the parents' age, level of education and employment status.

3.7. Research instruments

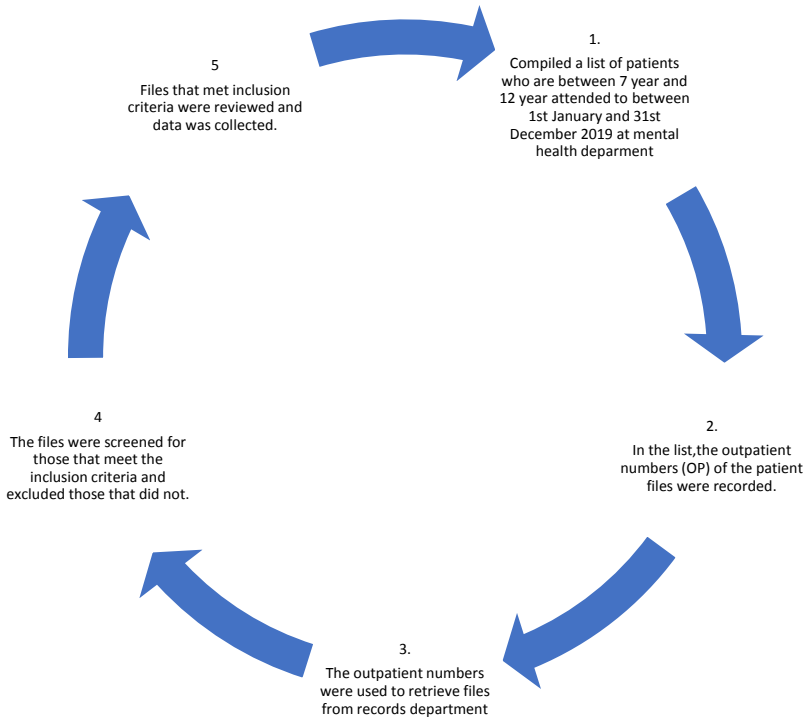
The researcher used a data collection form to document the data retrieved from the patients' files in the records department at KNH. Data collected were patients' source of referral, special education links, age, sex, residence, grade/class. Also, the possible risk factors to SLD development such as, neonatal and postnatal complications, delayed milestones, SLD, and SLD comorbidities, parents' age, employment status, level of education, and family history of SLD. Other Maternal risk factors collected were complications during antenatal, and perinatal periods. The data collection form is attached in Appendix.

3.8. Data collection procedure

Using patient record from mental health department, a list of patients between 7 and 12 years who were attended to between 1st January and 31st December 2019 was generated. Outpatient numbers (OP) were used to retrieve files from records department. Files of patients that meet inclusion criteria were reviewed. There was restricted access of the patient records only to the researcher. Completed data collection forms were strictly kept in a locked cabinet with access regulated by her. All data were anonymised to ensure privacy and confidentiality of patients'

personal information, with each participant assigned a serial identifier. Collected data was then entered into Microsoft and password-protected, with only the researcher having access to it; to ensure data security.

Data collection Flow chart



3.9. Quality Assurance

1. Before data collection was started, institutional approval was obtained from the Kenyatta National Hospital University of Nairobi Ethics and Research Committee (KNH-UoN ERC).

2. Written permission from Kenyatta National Hospital Research Office was obtained to allow the researcher to collect data at the Records Department. The clearance was then presented to the Head of Department, Mental Health Department who approved it, then to the head of statistics at the records department who upon approval, the list of the children attended to during the study period was generated and data was collected respectively.

3. The study was done under the supervision of two University of Nairobi department of Psychiatry lecturers.

4. Patients files and all data were treated with confidentiality. The patients' files during data collection process were kept in the data collection office at the records department with only the researcher having access.

5. Hard copies of the data was kept in a locked cabinet with only the researcher having access. To maintain the confidentiality of patients' information, the soft copies was stored in a Microsoft excel database that was password protected.

6. To reduce errors, double entry and checking methods was used in data entering.

3.10. Data Management

3.10.1 Data coding and data entry

Data was enumerated and then checked for completeness by the researcher. Data was then entered in RedCap.

3.10.2 Data cleaning

Cleaning and validation were done after the data was entered, checked and corrected to ensure a clean dataset then it was exported to SPSS for Windows version 27.0 for analysis.

3.11. Ethical consideration

1. Ethical approval to conduct this study from the Kenyatta National Hospital University of Nairobi Ethics and Research Committee (KNH-UoN ERC) was obtained before the study is conducted.
2. A written permission to carry out the study was obtained from the Research Office KNH.
3. The management of KNH and Child Psychiatric Clinic was informed on the intention to carry out the study at their institution and the purpose of the study was explained.
4. Data was collected in the records office to ensure confidentiality. Patient's files were kept in the record department. Names of patients were not recorded, but a unique study identification number was used to protect the confidentiality and anonymity of patients.
5. Hard copies of the data was kept in a locked cabinet with only the researcher having sole access. To maintain data security, the soft copies was stored in a Microsoft excel database that was password protected.

3.12. Informed consent

There was no need for informed consent since the study was a retrospective chart review. There was no need for patients to participate in the study using interviews or surveys since data was sampled from clinical records.

3.13. Conflict of interest

None to declare by Principal Investigator or Supervisor

4. RESULTS

4.1 Introduction

The researcher compiled a list of 270 patients between 7-12 years old at the KNH Mental Health Department from the psychiatric clinic attendance registration book, which had records of; the dates the patients attended clinic, the outpatient numbers, names, age, sex, and residence. The researcher then presented the list to the KNH records department which issued 266 patients files the other four files were missing. Ten files had missing patients' data therefore were not included in the study. The researcher reviewed 256 patients' files, and of the 256 patients' files, 35(13.7%) had a diagnosis of SLD. Data was collected from the 35 patients' files and analysed to respond to each study objective.

The results were presented as below

4.2 Socio-demographic characteristics of the children who were diagnosed with SLD at child psychiatric outpatient clinic at Kenyatta National Hospital

The mean age of the children who were diagnosed with SLD was 9.3 (SD 2.1) years, their minimum age was 7.0 years, and the maximum was 12.0 years. Their median age was 9.0 (IQR 7.0 – 12.0) years. They were 28(80%) males and 7 (20%) females. Majority 21 (60%) were from Nairobi County and the remaining 14(40%) were from Kiambu county. Majority 12(34.3%) were in grade 2, followed by pre-primary and grade 4 at 7(20%) each. Grade 3 and class 5 had the least number of learners with each having 1 (2.9%) case. (Table 1)

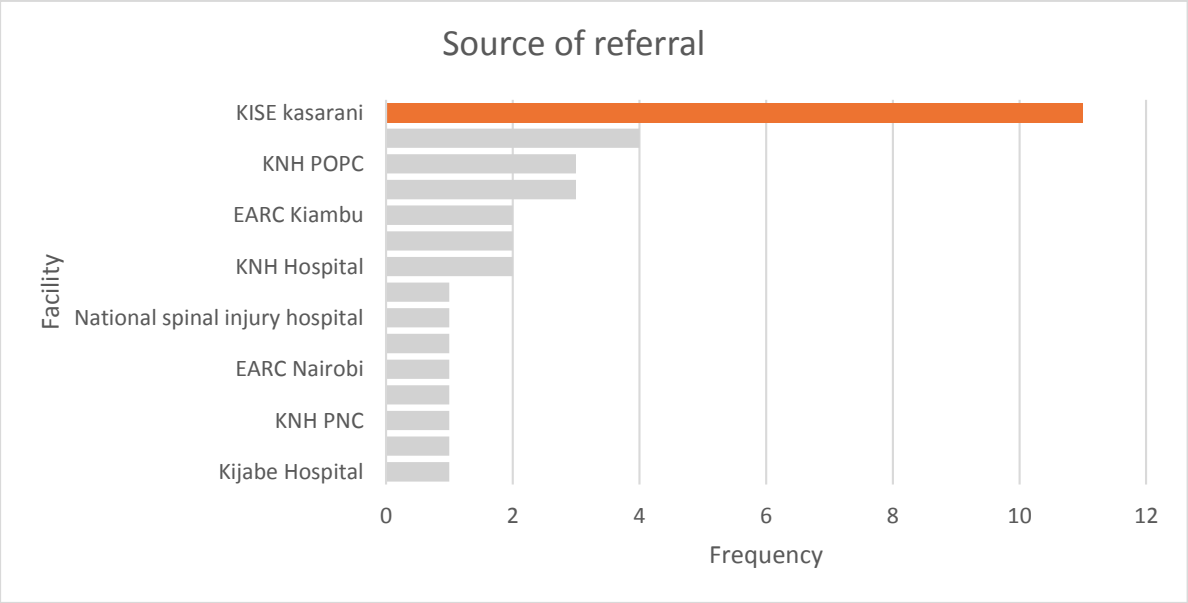
Table 1: Child Baseline characteristics

Characteristics	n (%)
Age (years)	
Median	9.0
Mean	9.31
Range	7-12
Sex	
Male	28(80.0)
Female	7 (20.0)
Residence	
Kiambu county	14 (40.0)
Nairobi county	21 (60.0)
Grade/Class	
Pre-primary	7 (20.0)
Grade 1	4 (11.4)
Grade 2	12(34.3)
Grade 3	1 (2.9)
Grade 4	7 (20.0)
Grade 5	1 (2.9)
Grade 6	3 (8.9)

4.3 Source of referral

Their clinical records showed that, each of the patient had been referred to the clinic. The records showed that; KISE Kasarani, referred 11 (31%) of the cases, KNH PEU was the next with 4(11.4%), KNH POPC, KNH A&E and Kikuyu hospital 3(8.6%) cases each, EARC Kiambu and KNH PGC 2(5.7%) each. The National Spinal Injury Hospital, EARC Nairobi, KNH PNC, KNH OT, KNH SOPC, Daima primary school and Kijabe Hospital each had referred 1 (2.9%). (Graph 1)

Bar graph 1: Source of referral



4.4 Linkage to Special Education

The clinical records showed that 27 (77.1%) were recommended for to be linked to special education services, 8(22.9%) had recommendations to remain in their respective main stream schools (Table 2)

Table 2: Special Education Linkages

	Frequency	Percent
No	8	22.9
Yes	27	77.1
Total	35	100.0

4.5 Pattern of specific learning disorder

Table 3 tabulates the patterns of SLD that were diagnosed as shown in the patients records in this study. The records showed that SLD was diagnosed in three patterns. Deficit in reading (dyslexia) was the most common diagnosed pattern of SLD. It was found in 30(11.7%) of the

cases. Deficit in writing (dysgraphia) in 16(6.3%), and deficit in arithmetic (dyscalculia) in 5(2.0%) of the cases. (Table 3)

Table 3: Patterns of Specific Learning Disorder

Dyslexia	**Frequency**, *n=35*	**Percent (13.7%)**
Yes	30	11.7
No	5	2.0
Dysgraphia		
Yes	16	6.3
No	19	7.4
Dyscalculia		
Yes	5	2.0
No	30	11.7

4.6 Isolated and combined Specific Learning Disorder

Isolated SLD was diagnosed in 8.7% of the cases, combined SLD in 5.0%**.** Isolated dyslexia was diagnosed in 17(6.7%) of the cases. Dyslexia as combined type with dyscalculia was diagnosed in 2 (0.7%) of cases, with dysgraphia in 8 (3.1%) and with dyscalculia and dysgraphia in 3 (1.2%) of the cases. Isolated dysgraphia was diagnosed in 5 (2.0%) of cases. Combined dyscalculia with dyslexia in 2 (0.7%) and with dyscalculia and dysgraphia in 3 (1.2%) of the cases (Table 4).

Table 4: Isolated and combined type Specific learning disorder

Combined and isolated SLD	Frequency (n=35)	Percentage (13.7%)
dyslexia	17	6.7
dysgraphia	5	2.0
dysgraphia, dyslexia	8	3.1
dyslexia, dyscalculia	2	0.7
dysgraphia, dyslexia, dyscalculia	3	1.2
Total	35	13.7

4.7 Comorbidities and SLD

When the comorbidities of the 35 patients with SLD was analysed, 82.9% of the cases had a diagnosis of a comorbid psychiatric illness (Table 5).

Table 5: Comorbidities

Comorbidity	Frequency	Percent
Yes	29	82.9
No	6	17.1
Total	35	100.0

ADHD was the most common diagnosed comorbidity, accounted for 14 (40%) of the cases diagnosed with SLD. Conversion disorder was the second most common diagnosed, it occurred in 17.1% of the cases with SLD, Motor coordination disorder in 11.4%, CD in 5.7%, depressive disorder in 5.7%, elimination disorder in 2.9% and autism in 2.9% of the cases with SLD. (Table 6)

Table 6: comorbidities.

Comorbidities	**Frequency**, *n=35*	**Percent 100**
ADHD		
Present	14	40.0
Absent	21	60.0
Conduct disorder		
Present	4	11.4
Absent	31	88.6
Convulsive disorder		
Present	3	8.6
Absent	32	91.4
Depressive disorder		
Present	2	5.7
Absent	33	94.3
Motor coordination disorder		
Present	4	11.4
Absent	31	88.6
Opposition defiant disorder		
Present	1	2.9
Absent	34	97.1
Anxiety disorder		
Present	1	2.9
Absent	34	97.1
Conversion disorder		
Present	6	17.1
Absent	29	82.9
Elimination disorder		
Present	1	2.9
Absent	34	97.1
Autism		
Present	1	2.9
Absent	34	97.1

Twenty percent (20%) were diagnosed with multiple psychiatric comorbidities with SLD. ADHD, motor coordination disorder and conversion disorder with SLD was diagnosed in 1 (2.9%) of the cases. SLD with ADHD and CD was diagnosed in 2 (5.7%) of the cases, SLD

with ADHD and Convulsive disorder in 2(5.7%), SLD with ADHD and ODD in 1(2.9%) of the cases. (Table 7)

Table 7: Comorbidities

	Frequency	Percent
ADHD	8	22.9
ADHD, motor coordination disorder, Conversion disorder	1	2.9
ADHD, CD	2	5.7
ADHD, Convulsive disorder	2	5.7
ADHD, ODD	1	2.9
Anxiety disorder, Convulsive disorder	1	2.9
Motor coordination disorder	3	8.6
CD	2	5.7
Conversion disorder	5	14.3
Elimination disorder	1	2.9
Autism	1	2.9
Depressive disorder	2	5.7
None	6	17.1
Total	35	100.0

4.8 Comorbidities and the patterns of SLD

When the accompanying comorbidities were analysed according to the pattern of SLD; dysgraphia, no dysgraphia. ADHD was found in 25. 0% (n=4), CD in 25.0% and conversion disorder 25.0% of the patients in the dysgraphia group. The other comorbidities were at much lower percentages compared to the three comorbidities. However only CD had a significant statistical difference with dysgraphia (p – 0.035). The proportions were against no dysgraphia with CD. (Table 8)

Table 8: Comorbidity and Dysgraphia

	Dysgraphia	No Dysgraphia	p-value
ADHD			
Present	4 (25.0)	10 (52.6)	0.096
Absent	12 (75.0)	9 (47.4)	
Conduct disorder			
Present	4 (25.0)	0 (0.0)	**0.035**
Absent	12 (75.0)	19 (100.0)	
Convulsive disorder			
Present	1 (6.3)	2 (10.5)	1.000
Absent	15 (93.8)	17 (89.5)	
Depressive disorder			
Present	0 (0.0)	2 (10.5)	0.489
Absent	16 (100.0)	17 (89.5)	
Motor coordination disorder			
Present	3 (18.8)	1 (5.3)	0.312
Absent	13 (81.3)	18 (94.7)	
Opposition defiant disorder			
Present	1 (6.3)	0 (0.0)	0.457
Absent	15 (93.8)	19 (100.0)	
Anxiety disorder			
Present	1 (6.3)	0 (0.0)	0.457
Absent	15 (93.8)	19 (100.0)	
Conversion disorder			
Present	4 (25.0)	2 (10.5)	0.379
Absent	12 (75.0)	17 (89.5)	
Elimination disorder			
Present	0 (0.0)	1 (5.3)	1.000
Absent	16 (100.0)	18 (94.7)	
Autism			
Present	1 (6.3)	0 (0.0)	0.457
Absent	15 (93.8)	19 (100.0)	

And when the comorbidities were analysed according to dyscalculia, no dyscalculia; conversion disorder had the highest percentage 60% (n-3) among the comorbidities in the dyscalculia group, it reached a significant statistical difference with dyscalculia (p- 0.026). The proportions were towards conversion disorder with dyscalculia. The other comorbidities in the dyscalculia group; however, the difference was not statistically significant. (Table 9)

Table 9: Comorbidity and Dyscalculia

	Dyscalculia	No Dyscalculia	p-value
ADHD			
Present	0 (0.0)	14 (46.7)	0.069
Absent	5 (100.0)	16 (53.3)	
Conduct disorder			
Present	0 (0.0)	4 (13.3)	1.000
Absent	5 (100.0)	26 (86.7)	
Convulsive disorder			
Present	0 (0.0)	3 (10.0)	1.000
Absent	5 (100.0)	27 (90.0)	
Depressive disorder			
Present	0 (0.0)	2 (6.7)	1.000
Absent	5 (100.0)	28 (93.3)	
Motor coordination disorder			
Present	1 (20.0)	3 (10.0)	0.477
Absent	4 (80.0)	27 (90.0)	
Opposition defiant disorder			
Present	0 (0.0)	1 (3.3)	1.000
Absent	5 (100.0)	29 (96.7)	
Anxiety disorder			
Present	0 (0.0)	1 (3.3)	1.000
Absent	5 (100.0)	29 (96.7)	
Conversion disorder			
Present	3 (60.0)	3 (10.0)	**0.026**
Absent	2 (40.0)	27 (90.0)	
Elimination disorder			
Present	0 (0.0)	1 (3.3)	1.000
Absent	5 (100.0)	29 (96.7)	
Autism			
Present	0 (0.0)	1 (3.3)	1.000
Absent	5 (100.0)	29 (96.7)	

When they were analysed according to; dyslexia, no dyslexia only CD disorder reached a significant statistical difference with dyslexia (p – 0.001). The proportions were against dyslexia with CD. (Table 10)

Table 10: Comorbidity and Dyslexia

	Dyslexia	No Dyslexia	p-value
ADHD			
Present	11 (36.7)	3 (60.0)	0.369
Absent	19 (63.3)	2 (40.0)	
Conduct disorder			
Present	0 (0.0)	4 (80.0)	**<0.001**
Absent	30 (100.0)	1 (20.0)	
Convulsive disorder			
Present	3 (10.0)	0 (0.0)	1.000
Absent	27 (90.0)	5 (100.0)	
Depressive disorder			
Present	2 (6.7)	0 (0.0)	1.000
Absent	28 (93.3)	5 (100.0)	
Motor coordination disorder			
Present	3 (10.0)	1 (20.0)	0.477
Absent	27 (90.0)	4 (80.0)	
Opposition defiant disorder			
Present	1 (3.3)	0 (0.0)	1.000
Absent	29 (96.7)	5 (100.0)	
Anxiety disorder			
Present	1 (3.3)	0 (0.0)	1.000
Absent	29 (96.7)	5 (100.0)	
Conversion disorder			
Present	5 (16.7)	1 (20.0)	1.000
Absent	25 (83.3)	4 (80.0)	
Elimination disorder			
Present	1 (3.3)	0 (0.0)	1.000
Absent	29 (96.7)	5 (100.0)	
Autism			
Present	1 (3.3)	0 (0.0)	1.000
Absent	29 (96.7)	5 (100.0)	

4.9 Neonatal complications

Majority 26 (74.3%) of children with the diagnosis of SLD had no recorded prior neonatal complication, 4 (11.4%) had recorded a history of low birth weight, 2 (5.7%) a history of neonatal jaundice. Birth asphyxia, neonatal sepsis, premature delivery were each recorded in 1 (2.9%) of the cases (table 11)

Table 11: Neonatal complications

	Frequency	Percent
Birth asphyxia	1	2.9
low birth weight	4	11.4
neonatal sepsis	1	2.9
Neonatal jaundice	2	5.7
premature delivery	1	2.9
None	26	74.3
Total	35	100.0

There was no significant statistical difference between neonatal complications and SLD (Table 12).

Table 12: Neonatal complications and SLDs

	Complications	**No complications**	**p-value**
Dyslexia			
Yes	9 (100.0)	21 (80.8)	0.297
No	0 (0.0)	5 (19.2)	
Dysgraphia			
Yes	5 (55.6)	11 (42.3)	0.700
No	4 (44.4)	15 (57.7)	
Dyscalculia			
Yes	1 (11.1)	4 (15.4)	1.000
No	8 (88.9)	22 (84.6)	

4.10 Delayed milestones

Only 14 (40%) of the cases had records that indicated presence of delayed milestones. (Table 13). Delayed milestones did not reach a significant statistical difference with SLD (Table 14)

Table 13: Delayed milestones

	Frequency, *n=35*	**Percent**
Delayed	14	40.0
None	21	60.0

Table 14: Delayed milestones and SLDs

	Delayed	**No Delayed**	**p-value**
Dyslexia			
Yes	12 (85.7)	18 (85.7)	1.000
No	2 (14.3)	3 (14.3)	
Dysgraphia			
Yes	9 (64.3)	7 (33.3)	0.072
No	5 (35.7)	14 (66.7)	
Dyscalculia			
Yes	2 (14.3)	3 (14.3)	1.000
No	12 (85.7)	18 (85.7)	

4.11 Socio-demographic characteristics of the parents of the children diagnosed with SLD

The mean age of the mothers was 38.8 (SD 5.8) years, where the minimum age was recorded at 30.0 years old, and the maximum at 52.0 years old. The median age was 38.0 (IQR 33.5 – 43.5) years. The mean age of the fathers was 44.0 (SD 7.7) years, where the minimum age was recorded at 32.0 years old, and the maximum at 62.0 years old. The median age was 41.0 (IQR 39.5 – 47.5) years. The records indicated the majority of the parents' level of education at primary level at 16(45.7%) and 18(51.4%) the for mothers and the fathers respectively. Only 13(37.1) of mothers and 12(34.3) of fathers had records of university degrees. Most of the parents, 16(45.7%) of mothers and 22(62.9%) of the fathers were recorded as self-employed. Only 9 (25.7%) of mothers and 9 (25.7%) were recorded as being in formal employment. 10 (28.6%) mothers and 4(11.4%) fathers were recorded as unemployed. (Table 15)

Table 15: socio-demographic characteristics of parents of the children diagnosed with SLD

Characteristics	n (%)	
Age (years)	Mother	Father
Median	38.0	41
Mean	38.8	43.9
Range	30-52	32-62
Level of education		
Primary	16(45.7)	18(51.4)
Secondary	6 (17.2)	5 (14.3)
University	13(37.1)	12(34.3)
Employment status		
Unemployed	10(28.6)	4 (11.4)
Employed	9 (25.7)	9 (25.7)
Self employed	16(45.7)	22(62.9)

4.12 Parents socio-demographic characteristics with SLD

When the parents' socio-demographic characteristics were analysed according to dyslexia, dyscalculia and dysgraphia, there was a significant statistical difference between maternal age and dyslexia (p- 0.025). The proportions were towards maternal age and dyslexia. The other parameters of socio-demographic characteristics did not reach significant statistical difference with the three patterns of SLD (Table 16, 17 and 18).

Table 16: Parents characteristics and Dyslexia

	Dyslexia	No Dyslexia	p-value
Mothers age			
30 – 39	18 (60.0)	0 (0.0)	**0.025**
40 – 49	11 (36.7)	4 (80.0)	
50+	1 (3.3)	1 (20.0)	
Fathers age			
30 – 39	9 (30.0)	0 (0.0)	0.083
40 – 49	16 (53.3)	2 (40.0)	
50+	5 (16.7)	3 (60.0)	
Mothers' education			
Primary	14 (46.7)	2 (40.0)	1.000
Secondary	5 (16.7)	1 (20.0)	
University	11 (36.7)	2 (40.0)	
Fathers' education			
Primary	16 (53.3)	2 (40.0)	0.804
Secondary	3 (10.0)	1 (20.0)	
University	11 (36.7)	2 (40.0)	
Mothers' employment			
Employed	9 (30.0)	0 (0.0)	0.183
Self-employed	14 (46.7)	2 (40.0)	
Unemployed	7 (23.3)	3 (60.0)	
Fathers' employment			
Employed	9 (30.0)	0 (0.0)	0.353
Self-employed	18 (60.0)	4 (80.0)	
Unemployed	3 (10.0)	1 (20.0)	
County			
Nairobi	18 (60.0)	3 (60.0)	1.000
Kiambu	12 (40.0)	2 (40.0)	

Table 17: Parents characteristics and Dysgraphia

	Dysgraphia	No Dysgraphia	p-value
Mothers age			
30 – 39	8 (50.0)	10 (52.6)	0.429
40 – 49	6 (37.5)	9 (47.4)	
50+	2 (12.5)	0 (0.0)	
Fathers age			
30 – 39	4 (25.0)	5 (26.3)	1.000
40 – 49	8 (50.0)	10 (52.6)	
50+	4 (25.0)	4 (21.1)	
Mothers' education			
Primary	7 (43.8)	9 (47.4)	0.740
Secondary	2 (12.5)	4 (21.1)	
University	7 (43.8)	6 (31.6)	
Fathers' education			
Primary	7 (43.8)	11 (57.9)	0.714
Secondary	2 (12.5)	2 (10.5)	
University	7 (43.8)	6 (31.6)	
Mothers' employment			
Employed	5 (31.3)	4 (21.1)	0.827
Self-employed	7 (43.8)	9 (47.4)	
Unemployed	4 (25.0)	6 (31.6)	
Fathers' employment			
Employed	5 (31.3)	4 (21.1)	0.880
Self-employed	9 (56.3)	13 (68.4)	
Unemployed	2 (12.5)	2 (10.5)	
County			
Nairobi	11 (68.8)	10 (52.6)	0.332
Kiambu	5 (31.3)	9 (47.4)	

Table 18: Parents characteristics and Dyscalculia

	Dyscalculia	No Dyscalculia	p-value
Mothers age			
30 – 39	1 (20.0)	17 (56.7)	0.130
40 – 49	3 (60.0)	12 (40.0)	
50+	1 (20.0)	1 (3.3)	
Fathers age			
30 – 39	0 (0.0)	9 (30.0)	0.083
40 – 49	2 (40.0)	16 (53.3)	
50+	3 (60.0)	5 (16.7)	
Mothers' education			
Primary	1 (20.0)	15 (50.0)	0.223
Secondary	2 (40.0)	4 (13.3)	
University	2 (40.0)	11 (36.7)	
Fathers' education			
Primary	3 (60.0)	15 (50.0)	1.000
Secondary	0 (0.0)	4 (13.3)	
University	2 (40.0)	11 (36.7)	
Mothers' employment			
Employed	2 (40.0)	7 (23.3)	0.404
Self-employed	3 (60.0)	13 (43.3)	
Unemployed	0 (0.0)	10 (33.3)	
Fathers' employment			
Employed	2 (40.0)	7 (23.3)	0.797
Self-employed	3 (60.0)	19 (63.3)	
Unemployed	0 (0.0)	4 (13.3)	
County			
Nairobi	5 (100.0)	16 (53.3)	0.069
Kiambu	0 (0.0)	14 (46.7)	

4.13 Family history of SLD

The presence of a family member with SLD was recorded in 10(28.6%) of the cases that were diagnosed with SLD (Table 19).

Table 19: family history of SLD

Family hx of SLD	**Frequency**, *n=35*	**Percent**
Yes	10	28.6
No	25	71.4

4.14 Family history of SLD

The results of the associations between family history of SLD and each of the patterns of SLD showed that, there were no statistical association between family history of SLD and each of the patterns of SLD (Table 20)

Table 20: History of SLD and the SLD

	History	**No history**	**p-value**
Dyslexia			
Yes	8 (80.0)	22 (88.0)	0.610
No	2 (20.0)	3 (12.0)	
Dysgraphia			
Yes	5 (50.0)	11 (44.0)	1.000
No	5 (50.0)	14 (56.0)	
Dyscalculia			
Yes	1 (10.0)	4 (16.0)	1.000
No	9 (90.0)	21 (84.0)	

4.15 Maternal complications

There were no data records of maternal antenatal complications in 34 (97.1%) of the mothers of the children diagnosed with SLD. Only 1(2.9%) cases of the patients' mothers were recorded to have had pre-eclampsia during the antenatal period. Thirty-one (88.6%) of the mothers had no records of perinatal complications, only 2 (5.7%) were recorded to have experienced preterm delivery. Pre-eclampsia and Prolonged labour were recorded in 1 (2.9%) case each. There were no post-natal complications recorded (Table 21).

Table 21: Maternal complications

	n (%)
Antenatal complications	Mother
None	34(97.1)
Pre-eclampsia	1(2.9)
Perinatal complications	
None	31(88.6)
Pre-eclampsia	1(2.9)
Preterm labour	2(5.9)
Prolonged labour	1(2.9)
Postnatal complications	
None	35(100)

4.16 Complications and SLD

When the maternal complications were analysed according to dyslexia, dysgraphia and dyscalculia, there was a significant statistical difference reached between maternal complications and Dysgraphia (p-0.035), however the difference between the dyslexia, dysgraphia and the maternal complications was not statistically significant (table 22)

Table 22: Maternal complications and SLD

	Complications	No complications	p-value
Dyslexia			
Yes	4 (100.0)	26 (83.9)	1.000
No	0 (0.0)	5 (16.1)	
Dsygraphia			
Yes	4 (100.0)	12 (38.7)	**0.035**
No	0 (0.0)	19 (61.3)	
Dyscalculia			
Yes	1 (25.0)	4 (12.9)	0.477
No	3 (75.0)	27 (87.1)	

5.0 DISCUSSION

5.1 Socio-demographic characteristics of the children diagnosed with SLD.

Patients' files of the ages between 7 to 12 years old were reviewed in this study as the study had targeted the early school going age groups. The mean age was found to be 9.31 years old. This varied with other studies age groups used, Altay et al cross sectional was conducted among 6 to 15 years old school going age group (Altay et al 2015), another study among 6 to 12 years (Bandla et al 2017), however the mean age in both studies was found to be approximately similar to the findings in this study 9 and 9.28 years respectively. The Kenya National Special Needs Education Survey Report (KNSNESR) 2018, in the report disability disaggregated by age, has also found that learning disability is highest (71.6%) between 6 to 15 years age groups school going children.

Majority of the patients who had been diagnosed with SLD (80%) were recorded as being at primary school level grade 1 to class 6, (20%) were recorded as pre-primary level of education cases. Their records showed that, this was their first time to be diagnosed as having SLD which indicated lack of early identification and interventions for SLD, lack of awareness about SLD among teachers and parents.

Majority of the patients were identified as male (80%), females were only 20% of the cases. This was in line with other study findings, *Hidalgo Vicario et al* found that SLD was two to three times more common in boys than girls (Hidalgo Vicario and Rodríguez Hernández, 2013). *Floden et al* on prevalence for developmental writing disorders among the school-age, boys were more affected than girls (Floden, A, Combs, 2012). *Reigosa-Crespo et al*, on the prevalence of dyscalculia male to female ratio was 4:1. The male gender has been associated with SLD (Chacko et al 2020). Studies have shown that, the males are highly biologically vulnerable right from their conception hence the higher numbers (Peters,H.K 2010).

The hospital records indicated that all the patients who were diagnosed with SLD were referrals to the clinic. The records showed, referrals from the various clinics at KNH at 42.9%, 40% were recorded as referrals from KISE Kasarani. EARC Kiambu, EARC Nairobi and Daima primary school were recorded to have referred 2.9% each of the cases, the reminder 14.2% were from other hospitals within Nairobi and Kiambu counties. Data on residence showed that, the patients resided within Nairobi (the slums and other parts of Nairobi) and Kiambu town 60% and 40% respectively with no big numbers in certain places. These findings were similar to Vidhukumar et al, 2020, cross sectional study, found that the patient places of stay were distributed in the municipality area with no particular place that the patients lived in large numbers. Studies have found that; there are no major variations in prevalence rates of SLD between urban middle class, slum, and rural areas (Srinath *et al.*, 2005).

5.2 patterns of Specific learning disorder

Three patterns of SLD (dyslexia, dysgraphia and dyscalculia) were diagnosed among the patients who were seen in the child psychiatric clinic in 2019. This was similar to Chacko et al 2020 study, found dyslexia, dysgraphia and dyscalculia as the patterns of SLD in their study. The APA 2013, has classified SLD as dyslexia dysgraphia and dyscalculia (Hidalgo Vicario and Rodríguez Hernández, 2013) . These findings of the diagnosis of SLD as only in terms of the three patterns could be because the APA 2013 current DSM V criteria for diagnosis of SLD has only identified the three deficits. Thus, clinicians only assessed SLD in 2019 in terms of the three deficits. SLD as a total was diagnosed in 13.7% of the cases, which was at the upper end of the generally believed range in the DSM V of 5% to 15% of school age children worldwide struggle with learning disabilities (Hidalgo Vicario and Rodríguez Hernández, 2013). Dyslexia was diagnosed in 11.7% of the cases and dysgraphia in 6.3% and dyscalculia in 2.0% of the cases. This differed with other studies done earlier in other regions, they reported

much higher values; in a study by Mogasale et al 2012, the prevalence of SLD in a city in southern India, was found to be 15.17% and 11.2%, 12.5% and 10.5% respectively for dyslexia, dysgraphia and dyscalculia. In yet another study the prevalence of SLD was 16.49%; dyslexia, dysgraphia and dyscalculia were 12.57%, 15.6%, and 9.93% respectively (Chacko et al 2020). Differences in the populations could have contributed to the lower findings in this study, as only a small population as referrals visited the clinic for diagnosis and interventions on SLD, whereas the other studies were conducted in schools where the populations were higher as the disorder is found among school going children.

Dyslexia was the most common diagnosed SLD among the cases. This was comparable to Moll *et al* study, found that 80% of the cases with SLD had dyslexia. It differed however, with Mogasale and Chacko studies, found dysgraphia as the most prevalent (Mogasale *et al.*, 2012) (Chacko et al, 2020). Which could be as result of regional differences different regions have different deficits prevalent. Dyscalculia was mainly diagnosed as combined. Combined type SLD was found only in 5.1% of the cases, which differed with other studies, found that combined types SLD occurred more frequently than standalone types (Moll *et al.*, 2014).

5.3 Comorbidities associated with SLD

This study found out that, 82.9% of the children who were diagnosed with SLD also had a diagnosis of another psychiatric illness. which was higher compared to Beitchman *et al* reported comorbidities in 50 percent of children with SLD (Beitchman *et al.*, 1998) and Hidalgo et al also reported 50% of the children with SLD have a comorbid psychiatric disorder (Hidalgo Vicario and Rodríguez Hernández, 2013). The higher values in this study could may be due to mainly that; the children who had problems that made learning difficulty, were the ones who were identified and were sent for interventions and then were discovered at the KISE, EARC, or the health facilities to have learning difficulties as a problem on its on hence were referred to the child psychiatric clinic for diagnosis and recommendation on interventions.

ADHD was the most common diagnosed comorbidity in this study, this was comparable to a study by Altay and another study by Karande, even ranged it 10% to 60% comorbid with SLD(Karande *et al.*, 2007) (Altay et al 2015). ADHD was recorded to overlap with CD, ODD, convulsive, motor coordination disorder and conversion disorder in this study. This varied with other study findings; ADHD overlapped with generalized anxiety disorder, tic disorder, and PTSD (Altay et al 2015).

ADHD, CD, ODD, anxiety disorder, depression, conversion disorder, Motor coordination disorder, elimination disorder and autism were diagnosed as the most comorbid with SLD in this study. This varied with other study findings; APA 2013, found; ADHD, CD, ODD, anxiety disorder, and depression as the most common comorbidities with SLD (Hidalgo Vicario and Rodríguez Hernández, 2013), another study found autism, epilepsy and cerebral palsy as the most common comorbidities (Somale et al 2016) and Altay et al 2015, found ADHD, generalized anxiety disorder, tic disorder, and post-traumatic stress disorder (PTSD), were more common.

5.4 parents' socio-demographic characteristics and SLD

In this study, mother's age reached a significant statistical difference with Dyslexia ($P < 0.025$, which varied with Jayasekara et al 1978 study, found that both increase in paternal and maternal age contributed to a greater incidence of dyslexia. There were no significant statistical difference between SLD and the parental level of education, their occupation in this study. However other studies, have found that, the education level of the father being university/above university (compared to primary school graduates) and the middle family income status (compared to low family income) were associated with a lower risk of SLD diagnosis (Altay et al 2020). Maternal complications, delayed milestones, and neonatal complications showed no significant statistical difference with SLD. However, a study by MacKay *et al* found that family history of learning difficulties, complications during childbirth, premature labor, low

birth weight, low Apgar score, neonatal jaundice, developmental delay, convulsions, low income families, and low socioeconomic status are all risk factors for SLD (MacKay *et al.*, 2013).

The difference in this study with the other studies could be due to that, the study relied on data collected from patient charts, that were clinician dependent, while the other studies utilized a well-designed questionnaire.

6.0 CONCLUSION, RECOMMENDATIONS AND STUDY LIMITATIONS

6.1 Conclusion

1. In conclusion the study found out that nearly 14% of the patients between 7 to 12 years old who attended child psychiatric outpatient clinic at KNH had SLD.
2. The patterns of SLD identified were; dyslexia, dysgraphia and dyscalculia. Dyslexia was the most common SLD.
3. The study also found a high comorbidity rate of other mental illnesses and SLD. ADHD was the most common comorbidity.
4. Sociodemographic characteristics such as male gender and maternal age had significant association with SLD.

6.2 Recommendations

1. The hospital's psychiatry department should implement a program of routine screening in order to detect SLD in all children who are diagnosed with other psychiatric disorders but do not perform well in their studies as the other psychiatric disorders may just be a mask to SLD in order to provide the appropriate care needed.

2. Depressive tendencies, emotional and behavioural disorders have been found in those with who have a learning disability. A child with a learning disability faces significant learning challenges and academic difficulties therefore there is need for early diagnosis (as early as at pre-primary level of education) in children to avoid the above problems and the delay in studies caused by SLD, as diagnosed SLD children receive specialized aid in their education.

6.3 Study assumptions and limitations

1. This study was done in a hospital setting and so may not be generalised to the general population.
2. This study depended on accurate data recording and record keeping that may often be of poor quality, leading to inferior level of evidence.

3. Insufficient sample size for statistical measurements, some patient files did not have all the relevant data/ detail needed for this research, had missing patient folders.

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8. Appendix

Table 1: Data collection tool parents

Unique identification number	Risk factors									
	Parents Age		Level of education		Employment status		Family history SLD	Mother's complications		
								Antenatal	perinatal	Postnatal
	Father	Mother	Father	Mother	Father	Mother				

Table 2: data collection tool child

Unique identification number						
Source of referral						
Special education links						
Age						
Residence						
Grade/ sore						
Risk factors	neonatal complications					
	Postnatal complications					
	Delayed milestone					
SLD	Reading					
	Writing					
	Arithmetic					
comorbidity	None					
	ADHD					
	ODD					
	MDD					
	CD					
	AUTISM					
	Other					

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PATTERNS OF SPECIFIC LEARNING DISORDER AND COMORBID PSYCHIATRIC DISORDERS AMONG CHILDREN WHO ATTENDED CHILD PSYCHIATRY CLINIC OVER A PERIOD OF ONE YEAR AT KENYATTA NATIONAL REFERRAL HOSPITAL

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