

Rockwell Leslie John

**Promoting oral health in adults with learning disability;
community and clinical interventions**

Universidade Fernando Pessoa

Faculdade de Ciências da Saúde

Porto, 2016

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I, Rockwell Leslie John, am writing a systematic review on “Promoting Oral Health in Adults with Learning Disabilities; clinical and community based intervention” certify the originality of the work as it can be confirmed with the bibliographic references.

**Dissertation submitted to
University of Fernando Pessoa
as a mandatory requirement for obtaining
Integrated Master in Dental Medicine**

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ABSTRACT

Introduction:

It is complex to define learning disabilities, there is no single universal definition used; there are different interpretations and definitions used for learning disabilities in different countries and communities. Primarily, the term “learning disability” sometimes used as “learning difficulties” is a term widely used in UK. There are various types and degree of severity of learning disabilities depending upon the extent of disorder. Though different definitions used all over the world, its types and classification coupled with their health and oral health needs are discussed in this review.

Objectives:

- To review the background literature on definitions of learning disabilities and health needs of this population.
- To review literature on individual clinical preventive intervention to determine the effectiveness in promoting oral health amongst adults in learning disabilities.
- To review literature in relation to community based preventive dental measures.
- To determine the interventions in this areas are appropriate to support policy and practice and if these interventions establish good evidence to suggest that the oral health needs of adults with learning disabilities are met or not.
- To make recommendations in implementing future preventive oral health interventions for adults with learning disabilities.

Methodology:

It was develop a comprehensive narrative synthesis of previously published literature from different sources and summarizes the whole research in a particular area identifying gap of knowledge. It provides a broad perspective of a subject and supports continuing education. It also is directed to inform policy and further research. It is a qualitative type of research with a broad question and critical analysis of literature published in books, article and journals.

The research question evaluated on PICOS criteria is: Effectiveness of preventive dental interventions in adults with learning disabilities.

The research question clearly defines the PICOS i.e. participants, interventions, comparison, outcome and study design. The Cochrane database of systematic reviews (CDSR), Database

of Abstracts of Reviews of effects (DARE) through York University and National Institute of Health and Clinical Excellence (NICE) was searched to identify need of this review.

There was no literature review found on the preventive dental interventions found hence, justifying this review. The guidance used in this review is from York University and methods opted for search of literature is based on the following: Type of participants, interventions, outcome measure, studies and search. The review of literature; author search; systematic and narrative reviews, through the following electronic databases via UFP library services: PubMed, Medline, EMBASE, CINAHL, Google scholar; Science Direct; Social and Medicine.

A comprehensive search of all available literature from 1990-2015, including systematic reviews, policy documents and some guideline documents was done. Internet resource used to access; Department of Health, World Health Organization, Disability World, Disability Rights Commission, the Stationery office, MENCAP, Australian Learning Disability Association.

The literature search was carried out with single word, combined words and phrases, authors' names and the title of literature search.

Results:

It is primarily looking at the oral health interventions available for adults with learning disabilities in clinical settings and the community measures observed over a period of 25 years 1990-2015. There were 7 of the clinical intervention studies and one community based intervention study was added in this review.

Conclusion:

There is a gap of knowledge identified in not having ample research in the area of preventive dental interventions in adults with learning or intellectual disabilities and there is a need of more research, studies need to be of a better quality and a special consideration is required in the community settings where maintenance of oral hygiene for this vulnerable group of society is hugely dependent on their caregivers. Though, the policy and guideline directs on the preventive dental interventions of adults with LD there still a gap evident in understanding and implication of the guidance in practice by the dental and care support team. Understanding learning disabilities and to identify their behavior, compliance and oral health needs is paramount for all professionals working with or for them at each level.

RESUMO

Introdução:

É complexa a definição de dificuldades de aprendizagem, não existe uma única definição que possa ser utilizada de forma universal; existem diferentes interpretações e definições utilizadas para deficiência na aprendizagem em diferentes países e comunidades. Em primeiro lugar, a terminologia "deficiência mental" usada às vezes como sinónimo de "dificuldades de aprendizagem" é uma designação amplamente utilizada no Reino Unido. Existem vários graus e tipos de distúrbios de aprendizagem em função da gravidade do tipo de distúrbio. Embora as diferentes definições utilizadas no mundo, os diferentes tipos e respectiva classificação são discutidos nesta revisão em conjunto com as necessidades de saúde e de saúde oral.

Objectivos:

- Rever a literatura sobre definições de distúrbios de aprendizagem e necessidades de saúde desta população.
- Rever a literatura sobre a intervenção preventiva individual clínica para determinar a eficácia na promoção da saúde bucal entre adultos com distúrbios de aprendizagem.
- Rever a literatura em relação às medidas preventivas saúde oral com base na comunidade.
- Determinar quais as intervenções nesta área que são apropriadas para apoiar as políticas e práticas bem como, se essas intervenções estabelecem boas evidências sugestivas de que as necessidades de saúde oral em adultos com distúrbios de aprendizagem são efectivas ou não.
- Realizar recomendações sobre a implementação de futuras intervenções de saúde oral preventivas para adultos com distúrbios de aprendizagem.

Metodologia:

Foi desenvolvida uma revisão narrativa e abrangente da literatura publicada, com origem em diferentes fontes sendo resumida a pesquisa encontrada, nesta área particular, identificou-se uma lacuna de conhecimento e com pertinência

Com esta perspectiva do assunto e no apoio a uma educação contínua foram analisadas as políticas instituídas e as mais recentes pesquisas.

Realizou-se uma pesquisa de tipo qualitativo assente numa ampla análise crítica da literatura publicada em livros, artigos e revistas.

A questão de pesquisa que foi avaliada sob critérios PICOS foi: Qual a eficácia das intervenções preventivas em adultos com distúrbios de aprendizagem". A pesquisa caracteriza claramente os critérios PICOS, ou seja: quais os participantes, quais as intervenções, que tipo de comparação, quais os resultado e o desenho do estudo.

Foram consultados para esta revisão: o banco de dados da Cochrane - revisões sistemáticas (CDSR), banco de dados de resumos de revisões de efeitos (DARE) através de Universidade de York e Instituto Nacional de Saúde e Excelência Clínica (NICE).

Não foram encontradas publicações na revisão da literatura encontrada sobre as intervenções dentárias preventivas e, portanto, justificando esta revisão. A orientação utilizada nesta avaliação é de Universidade de York e os métodos usados na pesquisa da literatura baseia-se no seguinte: Tipo de participantes, o tipo de intervenções, o tipo de medida de resultado, o tipo de estudos, tipo de pesquisa.

A revisão da literatura; foi ainda realizada com pesquisa por: autor; revisões sistemáticas e narrativas, através das seguintes bases de dados eletrônicas: *UFP* (serviços de biblioteca): *Pub-Med, Medline, Embase, CINHALL, Google scholar; Science Direct; Social e Medicine*. A pesquisa abrangeu de toda a literatura disponível entre 1990-2015, incluindo revisões sistemáticas, documentos políticos e alguns documentos de orientação clínica e foram ainda consultados outros sites para o efeito: Departamento de Saúde USA, Organização Mundial da Saúde, Associação de Mundial de Incapacidade, Comissão de Direitos na Deficiência, MENCAP, Associação Australiana de Distúrbios da Aprendizagem. A pesquisa bibliográfica foi realizada com uma única palavra-chave, ou palavras-chave combinadas, nomes dos autores ou por título bibliográfico.

Resultados:

Focados principalmente para as intervenções de saúde oral disponíveis para adultos com distúrbios de aprendizagem em ambientes clínicos e/ou através de medidas comunitárias, observados durante um período de 25 anos 1990-2015.

Havia 7 de estudos de intervenção clínica e um estudo de intervenção com base numa comunidade que foram considerados para esta revisão.

Conclusão:

Verificou-se que há uma lacuna de conhecimento devido a ausência de uma ampla pesquisa na área das intervenções odontológicas preventivas em adultos com dificuldades de aprendizagem ou com deficiências intelectuais e por isso há necessidade de mais pesquisas,

bem como, os estudos precisam de ser de melhor qualidade e requerentes de uma atenção especial é necessária face às características desta comunidade, onde a manutenção da higiene oral para este grupo vulnerável da sociedade é extremamente dependente dos seus cuidadores. No entanto, as políticas e orientações dirigidas às intervenções odontológicas preventivas de adultos com dificuldades de aprendizagem apresentam uma lacuna evidente na compreensão e implementação das práticas por parte da equipe de cuidados dentários. Compreender as dificuldades de aprendizagem e identificar os respectivos comportamentos e adesão na de saúde oral é fundamental para todos os profissionais que trabalham com, ou para eles, em cada nível.

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I. INTRODUCTION

The United Nations Universal Declaration of Human Rights Article 25 states:

“Everyone has the right to a standard of living adequate for the health and well-being of himself and his family, including...medical care and necessary social services.”(UN, 1948)

People with disabilities have the same rights to health and care as general population (Oral health and Disability, 2005), yet most researchers suggest and report, inequalities and unmet health needs, a distressing fact. People with disabilities including learning disability and mental health problems are at a higher risk of living in poverty (Palmer et al, 2006), and the relationship between social deprivation and poor health is well constituted (Acheson, 1998; Graham 2004), as in the case of health inequalities and dealing with deprivation is the step to improve health. However, it is conspicuous that health incongruity experienced by people with disabilities has scarcely been counted in broader health inequalities (Nocon & Sayce, 2008).

Recognizing rights of people with disabilities has always been a conscientious issue world over. However, ongoing reconsideration has reinforced the message of identifying people with disabilities as “subjects” with rights from “objects” of charity, medical treatment and social protection. The meticulous shift has enabled to change the whole ideology of identifying disability and the way we now perceive and treat it. The UN convention on “rights of people with disabilities” was adopted on 13th December, 2006 in New York, USA and came into force on the 3rd of May 2008. There were 82 signatories to the convention including European Union. (UN Convention, 2006).

The European Union (EU) is proactive in supporting the idea of integrating disabled people in the community, the EU promotes active participation of disabled people in society, in continuation of EU human rights approach for issues regarding disability, the legal framework has been established to imply equality by introduction of “Equal Opportunities

for people with Disabilities” and an action plan was devised by the EU to highlight disability issues and to issue appropriate policies and implementing specific measures to develop socio-economic integration of people with disabilities (EU-AP, 2004-2010).

The introduction of legislation enabling people to exercise their rights and community based agenda by the UK government policy has been welcomed by agencies, associated professionals and people with disabilities (Whitehead et al, 2008). There still are variations in implementation of person centered initiatives including, the amount of resources being spent on advocacy and the number of adults with learning disability in paid work by the local authorities. (Emerson & Hatton, 2008)

Mencap (a UK charity for people with learning disabilities) has launched its 'Getting it right' campaign to ensure that people with a learning disability get the level of health care they have a right to 'Getting it right' calls on health professionals to commit to a charter that will help them work towards better health, wellbeing and quality of life for people with a learning disability (Mencap, 2010). There are numerous other steps taken by Mencap in getting the people with learning disabilities integrated in the community and highlighting their right to vote, employment and introducing *protection of vulnerable adults* (POVA), which have all set a benchmark of guidance and practice in Health and Social Care in the UK. The regulatory body is *Care Quality Commission* (CQC).

There are more than 1 billion people in the world who possess some form of disability out of which 50% of disabled persons cannot afford health care. In a WHO convention 153 countries signed to work for rights of people with disabilities and made *WHO Task force on Disability* (WHO, 2011). The oblivious approach in identifying needs of people with disabilities often includes lack of appropriate medical care, access and barriers to health, especially in the low income countries (Maulik et al, 2011). Consequently, people with disabilities generally have a propensity for ill health and disease. There may be associated health issues by virtue of their disability and some by not receiving adequate healthcare facilities (oral health & disability: the way forward, policy document released in 2005, Ireland.¹

¹<http://www.dentalhealth.ie/publications/list/oral-health--disability/> cited 18th March 2016

Maintaining health in people with disabilities is challenging and community support is paramount. The community support enables to help improve the quality of life for disabled people, and to promote independence as much possible. Their active inclusion in society enables individuals to access community services; equal opportunities protect them from discriminatory environment as outlined in the *EU-Action Plan 2004-2010*, (Council of Europe, 2007). The multi-sector strategy empowers people to access and demand their share of benefit for education, employment and health from the society. People with disabilities living in the developed countries have better opportunities in everyday life across the spectrum of needs including access to healthcare, day services, social services support, education and employment. The inconsistency of service has also been greatly addressed in the UK by the introduction of *Mental Capacity Act 2007*, *Mental Health Act 2007*, *Disability Discrimination Act*, and *Valuing People: a new strategy for the 21st century* enabled development of private and public sector in Health and Social Care and safeguarded this population group across the UK. (UK Legislation) ‘Valuing people’, is the first white paper on learning disabilities in 2001, followed up in 2008 by a consultation called ‘Valuing people now’, which assesses progress on the success of ‘Valuing people’. Preliminary reports suggested more improvement, especially towards better independent living and employment opportunities for people with learning disability (Department of Health, 2001)

1. Definition and classification of Disability:

i. Disability:

Disability is a complex phenomenon as it resonates the correlation between bodily features of a person and the society they live in. Impairments, activity limitations or handicap come under the term disability. These are individually defined as;

According to the WHO (1980) a disability is a broad term and includes impairment, activity limitations and participation restrictions, it is defined as; “*Any restriction or lack (resulting from an impairment) of ability, to perform an activity in the manner or within range considered normal for a human being.*”

“*A physical or mental impairment which has a substantial and long-term adverse effect on a person’s ability to carry out normal day-to-day activities*” (Disability Discrimination Act, 1995)

ii. Types of disabilities:

The commonly used definitions in special care dentistry (branch of dentistry that deals with people with disabilities) are based on WHO definitions proposed in 1976 and 1980. The distinction between types of disabilities is given below:

- **Impairment:** is any loss or abnormality of psychological, physiological, anatomical structure or function.
- **Disability:** is any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being.
- **Handicap:** It is a disadvantage for an individual, resulting from impairment or a disability that prevents fulfillment of a role that is considered normal for that individual. The term “handicap” means loss or limitation (WHO, 1980).

iii. Classification of Disabilities:

Disability can be acquired or hereditary, disabilities can be broadly classified as illustrated in the table 1.

Table 1: Disability and Impairment (based on: Scully et al, 2007)

Disability	Impairments
Physical	mobility, respiratory
Mental	emotional, social
Sensory	hearing, visual
Cognitive	learning, attention

Disabilities may be classified in variety of ways; developmental disabilities are caused by impairments that occur during developmental stages (birth to age 18) including intrauterine infections, metabolic defects or fetal abnormalities, fetal alcohol syndrome, chromosomal discrepancies, birth hypoxia, autism, cerebral palsy and postnatal infections such as meningitis or encephalitis. The acquired disabilities are caused after the developmental years such as traumatic brain injury, spinal cord damage, multiple sclerosis, arthritis and Alzheimer's disease. Disabilities, in different eras have been perceived in various ways. The innovation of science has enabled us to correlate disabilities with medical and social perspective. Though, disabilities limits day to day functioning, it not only needs medical consideration but social too, and for some;²

²(<http://www.disability-quotes.com>).

“Disability is a matter of perception. If you can do just one thing well, you're needed by someone.” - Martina Navratilova

2. Motivation:

Having worked with people with learning disabilities and monitoring their day to day dietary and parafunctional habit that may have an impact on their oral health. I started researching their prevailing oral health and the treatments offered on a clinical and community level. It intrigued me to study literature of last 25 years based on this subject to probe the existing knowledge, policy and literature. Hence, I decided to write a literature review on the studies available on this subject. This review is primarily looking at the oral health interventions available for adults with learning disabilities in clinical settings and the community measures observed over a period of 25 years 1990-2015. There were 7 of the clinical intervention studies and one community based intervention study found based on my objective and inclusion criteria and was added in this review. The collated material is strictly based on my inclusion criteria, research question and evidence base. I have researched the research question through credible database available and sought expert advise from Special needs Dental professionals. I used authentic search engines with appropriate search words keeping in line with the topic that is discussed in this humble piece of work.

3. AIMS & OBJECTIVES:

The principal aim of this review is:

To assess the overall effectiveness of preventive oral health interventions for adults with learning disabilities.

The objectives of this narrative review are:

- To review the background literature on definitions of learning disabilities and health needs of this population.
- To devise a narrative review methodology to meet the aim.
- To review literature on individual clinical preventive intervention to determine the effectiveness in promoting oral health amongst adults in learning disabilities.
- To review literature in relation to community based preventive dental measures.
- To determine the interventions in this areas are appropriate to support policy and practice and if these interventions establish good evidence to suggest that the oral health needs of adults with learning disabilities are met or not.
- To make recommendations in implementing future preventive oral health interventions for adults with learning disabilities.

II. DEVELOPMENT

1. Learning Disabilities:

i. Historical Background of Learning disability:

The foundation of the *National Health Service* in the UK in 1946 presented a medical model of disability and then the term “mental handicapped” was used. Learning disability was formerly known as mental handicap and mental retardation (WHO, 1996). These terms are now obsolete and are found offensive in the UK. Though in some countries it is still used, with growing understanding about disabilities and the respect and dignity of individuals with disabilities the term “learning disability”, is exclusively used in the UK.

People with learning disabilities and mental health problems lived in institutions and mental asylums which then became hospitals, with care as the basic emphasis for such individuals residing at hospitals. In 1959, the *Mental Health Act* was introduced for the first time which established distinction between “mental illness” and those having a “mental handicap”. After continued complaints regarding the appalling conditions in hospitals the Government in 1971 published a paper, “Better services for the Mentally Handicapped”, which laid the foundation for “Care in the community”. It was recognized that these institutions were an obstacle in community cohesion for people with LD (Mencap, 2010).

The concept of “Normalization” came in 1980s; which basically influenced the delivery of care to people with disabilities. It emphasizes on valuing people, their right to choice and opportunity, and the right support to maximize and fulfill their potentials (Mencap, 2010).

ii. Definition of Learning Disability in UK :

It is complex to define learning disabilities, there is no single universal definition used; there are different interpretations and definitions used for learning disabilities in different countries and communities. Primarily, the term “learning disability” sometimes used as “learning difficulties” is a term widely used in United Kingdom. These two terms are often interchangeably used in health and social care. However, learning difficulty includes “people with Specific learning disability” like dyslexia when associated to educational context.

Moreover, moderate, severe and profound multiple learning difficulty are all parts of learning difficulties in the *Special Education Needs (SEN)* (Department for Children, Schools & Families, 2009; Department of Education & Skills, 2001). In USA, Canada and Australia the preferred term is “intellectual disability” that corresponds to the UK term “learning disability.”

The current definition used in the UK is as outlined in the “Valuing people, 2001 White Paper” on the health and social care of people with learning disabilities. According to this, learning disability is identified as:

- Significantly reduced ability to understand new or complex information, to learn new skills (impaired intelligence), with;
- A reduced ability to cope independently i.e.(impaired social functioning);
- That started before adulthood, with a lasting effect on development (Department of Health, 2001).
- Learning disability is a fairly new term; mostly used in the UK, It is defined in ICD-10 that is medical classification list of diseases and sign and symptoms by the WHO (WHO, 1992; 1996). According to this approach, Individuals with learning disability have a low intelligence and limited capacity of understanding and independence. Some with severe intellectual disability (lower IQ) may also possess physical disabilities (O’Brien & Kumaravelu, 2008).

iii. The definitions of Learning Disability in USA:

The definition by Individuals with Disabilities Education Act, USA (IDEA);

The Specific Learning Disability (SLD) in the US was defined on the basis of eligibility for special education services; this definition was carried since 1975 until the endorsement of IDEA in 2004 that defines SLD similar to previous versions of the law; “*A disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia and developmental asphasia.* (Taymans, 2011).

iv. Definition of Specific Learning Disability:

Historically, the specific learning disability (SLD) was recognized as an evident disabling condition and was based on competence at school. Those individuals who would fail to accomplish at school would be counted in, based on their intellectual limitations and emotional disabilities. It was legally recognized in the US in the 1960s as a disabling condition for the first time, and the search for a precise definition is continues till today (Mercer & Pullen, 2009).

Hammill (1990) established that 11 different definitions have been used to describe the condition so far. The *Specific Learning Disability* (SLD Act) defined today is based on federal definitions, initiated with Public Law 91-230, the SLD Act 169, has been instrumental in developing the understanding essential traits of this SLD condition. Policy makers, and advocacy partners have always used federal definitions in bringing more clarity to the subject.

v. **Learning disability and associated medical and behavioral conditions:**

Learning disabilities are often accompanied by secondary conditions which can be physical and/or sensory impairment and may include health and/or behavioral issues; such as Down's syndrome, epilepsy, neurodevelopmental; autistic spectrum disorder and may possess challenging behavior and/or associated mental health problems. Psychiatric disorders associated with learning disability may include; Attention deficit hyperactivity disorder (ADHD), Autism, behavioral disorders, depression and bipolar, Pica, Schizophrenia, Sleep disorders and self-injury. Asperger's syndrome is not included as part of autism or mild autism as they score average or above average on the intelligence tests.

The definition of learning disability according to O'Brien & Kumaravelu, (2008) is based on three components:

1. Intelligence at least two standard deviations below the population mean (IQ < 70).
2. Onset is "within the development period" i.e. < 18 years of age.
3. Significant associated impairment of social functioning or capacity for independence.

Learning disability is classified as mild, moderate, severe and profound as shown in the table below. Identification of low IQ is crucial for detection of learning disability.

IQ may be defined as $\text{mental Age} / \text{chronological Age} \times 100$. However, defining learning disability on the basis of IQ is inappropriate as there are concerns regarding the validity and reliability of IQ testing. IQ achievement discrepancy is not a valid mean to define Learning Disability, and invalidating IQ tests in recognition of LD will enable shift towards Special Education and maximizing potential of learning in people with LD (Pasternack, 2002).

It is debated that IQ scores measures factual knowledge, expressive language abilities and short-term memory, since people with learning disabilities may lack in some areas resulting in lower scores, retrospectively it has been observed that some people with low IQ scores are good readers, thereby stating that low IQ does not necessarily mean poor reading skills. Pragmatic evidence proves that poor readers on various IQ levels show similar reading and

other language skills. Hence, on logical basis IQ test scores were deferred to define learning disabilities (Siegel, 1999).

Table 2: Classification of LD adopted by O'Brien and Kumaravelu, (2008)

Category	IQ Level	Functional Ability
Mild	50- 69	Mostly capable of semi independent living
Moderate	35-49	Need support for daily living not capable of semi independent living may have the ability to express their wishes
Severe	20-34	Little capacity for expression of wishes – only of basic requirement
Profound	< 20	Wholly dependent on others

vi. Prevalence of Learning Disability in the UK:

Learning disability is the most common disability in the UK and an estimated 1.5 million people are affected in England alone, which is likely an underestimate (Emerson & Hatton, 2008) Learning disability varies from mild impairment to severe or profound disability. More males than females are affected with about one quarter being children aged below 16. Approximately, a quarter of total population with learning disabilities is profoundly disabled with additional disabilities. However, an estimate predicts an increase of 14% between 2001 and 2021, resulting in population increase to approximately 2 million with learning disabilities by 2021 (Emerson & Hatton, 2008). The various types of learning disabilities are of as discussed and their prevalence is:

- **Down syndrome:** 1.04 per 1000 births most common condition, accounts for nearly a third of all learning disabilities (approximately, 600 babies born annually in the UK).
- **Epilepsy:** 5-10 per 1000 people (up to 1%), the frequency of epilepsy in learning disability is much higher than in the general population with epilepsy alone. Mild learning disability is around 6 per 1000 which is approximately 10 times higher than the general population with epilepsy. 30% of all learning disabled people have some form of epilepsy and maybe 50% in the severe LD.
- **Challenging Behavior:** It is 0.5 per 1000 of the general population. The overall prevalence of challenging behavior increases with age.
- **Autism:** This is about 1.5 per 1000 of the general population. 50% of people with moderate to severe LD possess symptoms of Autistic Spectrum Disorder, mild learning disability.
- **Mental Health problems:** 25-40% of people with learning disability experience psychiatric disorders more in people with learning disability than the general population.
- **Attention deficit hyperactivity disorder (ADHD):** 3-5% of children, it is twice more common in boys than girls. Often continues in adolescence.
- **Tourette's syndrome:** 1%, out of which 90% have co-morbid psychiatric disorders.³

³(<http://www.understandingindividualneeds.com>, 18th February, 2016)

Table 3: Prevalence of learning disabilities (LD)

Conditions	Prevalence
Down's Syndrome	1.04 per 1000 births
Epilepsy	5-10 per 1000 people (up to 1%)
Challenging Behavior	0.5/1000 of the general population.
Autism	1.5/1000 of the general population.
Mental Health Problems	25-40% of people with LD experience psychiatric disorders
Attention deficit hyperactivity disorder (ADHD)	3-5% of children
Tourette's Syndrome	1% of the population

vii. Learning Disabilities and General Health:

People with learning disability are more likely to suffer from health problems like congenital heart defects, immunosuppression, obesity, physical disabilities, sensory impairment; speech or hearing impairments, epilepsy and mental health problems, hence people with learning disabilities experience poor general and oral health (Emerson & Baines, 2010).

viii. Mortality and learning disabilities:

People with learning disabilities are 2.5 times more likely than other people to have health problems. Cardiovascular diseases, *Diabetes Mellitus* and respiratory diseases and they are twice more likely to die early than general population, in which, people with moderate and severe impairments are more susceptible (Morgan et al, 2001).

There is a higher mortality among people with learning disabilities seen (Morgan et al, 2001). Some of the morbidity and mortality can be prevented (Nocon & Sayce, 2008; Disability Rights Commission, 2006). Severity in learning disability, reduced mobility, feeding difficulties and other support needs, and Down syndrome intuitively increases mortality (Strauss et al, 1998; Van Allen et al, 1999). Unexplained deaths in epilepsy are also seen (Forssman & Aksesson, 1970; Leestma et al, 1989).

The life expectancy of people with LD is increasing (Richards & Siddiqui, 1980). In the 1930s it was estimated to be less than 20 years of age (Holland, 2008). Mean life expectancy is now estimated to be 74 for mild, 67 for moderate and 58 for people with severe LD (Bittles et al, 2002).

Recent reports have highlighted evidence that people with LD have higher levels of unmet health needs or have received less effective treatment, and have potential barriers to health, despite legislation that explicitly establishes a legal framework for the delivery of equal treatment, clearly showing the inequalities in health for people with LD (Disability Rights Commission, 2006 & 2007; Mencap, 2007; Michael 2008; Surgeon General, 2002).

2. The Health Needs:

The medical problems associated with learning disabilities are complex and require additional and special care in its clinical management; the medical problems are as follows:

- **Attention Deficit Hyperactivity Disorder (ADHD):** ADHD is characterized by inattention and hyperactivity, impulsive and overactive. They are unable to stop or curb their immediate reactions. Deficit in attention and motor control and perception (DAMP) may vary. They are found to have gross behavioral problems including uncontrolled activity, inattentive and distracted. The hyperactivity can lead to aggression. Running, pacing around, climbing or leaving the seat and difficulty waiting are the typical attributes of ADHD. The diagnosis is established by clinical findings and appears before 7 years of age continued for 6 months. Falls dental and

minor head injuries or undetectable brain damage are common in ADHD and Tourette's syndrome.

- **Autistic spectrum disorder:** People with autism like to live in isolation and have a set routine to do things in a particular way, they have difficulty adapting to change, they appear indifferent and remote, and are unable to form emotional bonds with others, they are unable to understand other peoples thoughts and feelings and needs. The main features include; onset in the first 2-3 years of childhood, profound aloneness, obsessive. Language and intelligence often fail to develop fully. Repetitive behavior is common. Temporal lobe epilepsy develops in about 30% of people with autism. Some people are very intelligent but 70% have an IQ less than 70. (Scully, 2005).
- **Down syndrome:** Down syndrome was discovered by John Langdon Down, hence the name. It is a chromosomal disorder called the Trisomy 21 and is common in older mothers incidence is 1:376 at 35 years and 1:30 at the age of 45 years, over 20% born to mothers over 35 years i.e. 1.5:1000 births. People with Down syndrome possess a number of medical problems including; congenital and valvular heart disease, pronounced gag reflex, husky voice or no speech at all, predisposition to develop leukemia, early dementia, mitral valve prolapsed can lead to dysrhythmias, embolism and sudden death, if it causes a systolic murmur, it can predispose to infective endocarditis, particularly in older persons. A greater incidence for atlantoaxial instability may result in spinal cord compression if neck is not handled gently. Hearing impairment, congenital hypothyroidism and a higher propensity towards infectious disease, particularly pneumonia are common occurrences. Chronic respiratory infection like tuberculosis middle ear and nasal sinus infections, immune defects skin infections, eczema and gastrointestinal problems are common. (Scully, 2005).
- **Cerebral Palsy:** Cerebral palsy; a common congenital anomaly with motor neuron defects caused by brain damage in the early course of development in the intra uterine life. Diagnosed by cerebral CT or MRI, mainly caused by hypoxia, trauma and infection or hyperbilirubinaemia, coupled with this biochemical and genetic factors may still be involved. Up to 50% of the people possessing cerebral palsy may have

additional disabilities; epilepsy, defects in hearing, weakness of one or more limb, abnormal gait, speech and hearing impairments, emotional disturbances (depression) learning impairment however some are found to be highly intelligent. Epilepsy can also be associated. (Scully, 2005).

- **Epilepsy:** Epilepsy is characterized by seizures of any type that are chronic or recurrent. It is a brain disorder or paroxysmal neuronal discharge sufficient to cause a seizure, detected by electroencephalogram (EEG). It can be caused by; brain injury, cerebrovascular disease (stroke, TIA), brain occupying lesions such as tumors or haematomas, metabolic abnormalities, intoxication, alcohol withdrawal or from illicit drugs especially cocaine and amphetamines, diabetes mellitus, phenylketonuria (PKU), infections like meningitis, brain abscess, encephalitis, neurosyphilis, HIV/AIDS or other immune disorders, degenerative disorders; senile dementia and Alzheimers disease (Scully, 2005).

The complex health needs are connected with oral health. Oral health is often treated secondarily and detached from the general health (Armour, 2008). The WHO enlists about 120 disease and conditions with oral manifestations (WHO, 1992). Managing oral health for a person with LD is imperative and requires special consideration in management.

i. Oral health in people with Learning Disabilities:

A systematic review was conducted to evaluate oral health of people with intellectual disabilities. According to the review two groups of people i.e. Down syndrome and people who are not cooperative at the routine dental care have found to be more prone to the oral health problems (Anders et al, 2010).

ii. Oral Hygiene:

Overwhelming evidence confirms that people with LDs have poorer oral hygiene and high levels of plaque, as they are unable to perform efficient plaque removal (Thornton et al,

1989) which is linked to poor cognitive skills and impaired physical skills, poor dexterity and inability to independently complete their daily tasks such as brushing their teeth (Owens et al, 2006) and by virtue of disability poor oral musculature also doesn't help the situation which retrospectively, aids natural oral cleansing (Shaw et al, 1989).

Improper plaque removal by brushing is associated to the caregiver's negative attitude towards dental health. Lack of consistent support in brushing or supervising may impede the process of achieving good oral hygiene and since, people with learning disabilities hugely depend on the caregiver for assistance and support, care giver's inadequate training in oral health, their knowledge, attitude and behavior can negatively impact on oral health (Cumella, 2000; Thornton et al, 1989).

iii. Dental Caries:

Prevalence of caries is not high, in fact caries rates are similar as the general population (O'Donnell, 1984; Oredugba, 2007; Francis et al, 1991; Kendall, 1991) however, the rates of untreated caries is much higher in people with LDs as identified in the systematic review conducted by Anders et al. 2010. Interestingly, it is also established that people with learning disabilities living in the community settings have worse oral health as compared to those inhabiting in hospital or institutional settings.

Structured oral health programs, balanced diet, supervised intake of carbohydrates (Steinberg et al, 1978; Gabre et al, 1999; Rodriguez Vazquez et al, 2002) and better access to the dental services in institutional settings are attributed to good oral health (Tiller et al, 2001). Caries rates in people with LDs are low or as same the general population and missing teeth due to periodontal reasons, and lack of cooperation at the dental appointments, and those who cannot tolerate simple preventive procedures (Gabre et al, 1999; Horwitz et al, 2000).

iv. Periodontal Health:

There is profound evidence to suggest that people with LD are found to have periodontitis and gingivitis with greater severity, and possess higher prevalence and greater severity of periodontal disease. Especially, individuals with DS are more prone to it, considering the additional risk factors. The mechanism is not yet known, though impaired cell mediated and humoral immunity decreased phagocytic and chemotactic response, altered action of hosts and enzymes and increased amounts of prostaglandin E2 all constitute pathogenesis of periodontal disease in individuals with DS (Lopez-Perez et al, 2002; Sakellari et al, 2005; Zigmond et al, 2006).

Poor oral health may be an additional problem coupled with the disability. It affects the moods, dignity and self-esteem. It will affect the day to day activities as eating, speaking and chewing may lead to social exclusions i.e. bad breath crowded or mal aligned teeth, pain discomfort and other oral diseases. Undoubtedly, good oral health may enhance; self-confidence and social integration. It also has an impact on the general health too and improves quality of life. Holistically, good oral health helps people with disabilities to face the world with more confidence, giving them better opportunities to participate and social integration.

v. Special considerations in dental management for people with learning disabilities:

Oral health care needs are peculiar in different conditions and hence, distinctly treated. Some of the conditions associated with LDs highlighting their oral finding and the dental intervention used. (Adapted from Scully et al, 2007)

- **Attention Deficit Hyperactivity Disorder (ADHD):** Individuals with ADHD are prone to caries and bruxism and require special dental management. They need brushing assistance; electric brushes are usually not tolerated due to bristle movement.

- **Autistic Spectrum Disorder:** People with autism may prefer sweet foods, sometimes as rewards. Caries and periodontal problems are prevalent and poor oral hygiene and bruxism is common. More than 20% of autistic people bite on object or introduce fingers in their mouth. Oral lesions are also due to auto aggression or convulsive crisis. Managing caries and improving oral hygiene is the key for dental management in treating autistic people.
- **Cerebral Palsy:** People with cerebral palsy often have; drooling of saliva, difficulty swallowing, abnormal muscle tone. Maxillary arch is frequently tapered or void, with a high palate. Upper teeth are labially inclined, due to pressure of tongue against anterior teeth. Class II div I, bruxism, attrition and subluxation of temporomandibular joint (TMJ), delayed eruption of primary dentition, enamel hypoplasia is common. Periodontal disease is another common finding.
- **Down syndrome (DS):** People with DS have underdeveloped middle 3rd of the face, large tongue (macroglossia), hypodontia, and an open mouth posture, lips thick, fissured and dry. Anterior open bite, posterior cross bite & other malocclusion are common. Delayed eruption, missing teeth commonly; lateral incisor, early onset of periodontal disease are common observations. Caries incidence is usually low. DS people usually not cooperative with dental treatments, regular oral hygiene instructions, caregivers play important role in oral health maintenance; general anesthesia is indicated for some procedures.
- **Epilepsy:** Seizures may have craniofacial sequel from frequent falls and muscle spasm, resulting in lip, cheek and tongue bite and lacerations, and fracture or chipping of mostly anterior teeth. It can also result in facial injuries, lacerations and fracture to facial skeleton. Undesirable effects of anticonvulsant treatment and medication include; phenytoin induced gingival swelling and/or ulcers secondary to folic acid deficiency anemia, palatal petechiae as a result of platelet aggregation inhibition due to valporic acid use. Carbamazepine another drug to control epilepsy causes depression of bone marrow and ulcers due to agranulocytosis.

Clinician need to be careful; not to misinterpret a seizure as lack of cooperation or antisocial behavior. It is best to carry out all dental treatment when the patient is in a settled phase, when the epilepsy is controlled and the seizures are infrequent. Factors that may precipitate or induce a seizure needs to be identified and avoided to conduct a dental procedure. Dental treatments can always present challenging, use of makaton signs, preventive dental program, powerful aspiration required. Dental chair to move slowly to prevent spastic muscle responses, muscle relaxants may be beneficial.

3. Dental Service available in the UK:

The *National Health Service* has Community Dental Service and specialized service Special Care Dentistry to cater the needs of people with disabilities. A review was carried out to evaluate special care dentistry in the UK. It was observed that established clinicians work alongside professionals from other disciplines social services, colleagues in health and voluntary organizations to ensure integrated health care planning. It has a patient base of 850 to 1500 patients per year working across *Primary Care Trusts* (PCTs) and hospital settings. It was concluded that an estimated 133 specialists are suggested for future, working in a network with other dentists with special interests and primary care practitioners. The special care dentistry should be formalized to meet the needs of the most vulnerable group of the society (Gallagher, 2007).

There have been a number of guidelines established for best practice and integrated oral health care support for people with learning disabilities with the view to meet the unmet needs and bridge the gaps. However, people with disabilities remain vulnerable and require particular attention to ensure both general and oral health care provision to meet their needs.

4. Barriers to oral care:

The barriers in oral health care for people with LDs can be classified on individual, professional, society and government basis.

- **Individual:** Poor dexterity, communication (speech or/and hearing impairment), lack of perceived need, anxiety or fear, financial considerations and lack of access.
- **Professional:** inappropriate manpower resources, inadequate training, discrepancy in geographical distribution, inadequate training in relation to learning disabilities/special needs, reluctant attitude.
- **Society:** the societal improper planning of manpower resources and inadequacy in planning oral health care facilities, insufficient public support that is conducive to health, inadequate facilities to carry out research.
- **Government:** lack of political will, inadequate resources, low priority, inability to develop appropriate policy.

Communicating discomfort or pain in LDs may be an obstacle in accessing appropriate and timely care. This may in turn trigger challenging behavior and feeling of frustration resulting in self harm or damage. Maintaining good oral hygiene, proper brushing due to dexterity and increased sugary foods can be a challenge in maintain oral health. In institutional care sometimes sweet foods are often used as an incentive for behavior modeling. Compliance at the dentist and following advice is also a barrier. Dental attendance of people with LDs is also lower than the general population (Armour, 2008).

5. Prevention of Oral Disease:

There is an increased emphasis on prevention considering the complex health needs of disabled people, evidence suggest the longevity and improving quality of life is linked to prevention and appropriate care. Therefore, more efforts needs to be put together on developing preventive clinical and community based strategies in encountering the challenges of health. There is gap of knowledge identified in maintenance of oral hygiene and reduction

of dental diseases in adults with LDs. There is lack of literature reviews and research in evaluating preventive dental measures both in clinical and community based settings. Hence, the shortcomings observed in policy implication and improper training of caregivers and dental professionals.

6. Methodology:

There are two types of literature reviews; systematic and narrative, both have distinct characteristics and goals. A narrative review is also called an unsystematic review (Oxman, 1994). It does not have rigorous methodology as a systematic review and are comprehensive narrative synthesis of previously published literature. Narrative review have their own distinction as these overviews comprehensively unite educational literature from different sources together as a document and summarizes the whole research in a particular area identifying gap of knowledge. It provides a broad perspective of a subject and supports continuing education. It also is directed to inform policy and further research. It is a qualitative type of research with a broad question and critical analysis of literature published in books, article and journals.

The research question evaluated on PICOS criteria is:

“Effectiveness of preventive dental interventions in adults with learning disabilities.”

The research question clearly defines the PICOS i.e. participants, interventions, comparison, outcome and study design. The Cochrane database of systematic reviews (CDSR), Database of Abstracts of Reviews of effects (DARE) through York University and National institute of Health and Clinical Excellence (NICE) was searched to identify need of this review.

There was no literature review found on the preventive dental interventions found hence, justifying this narrative review. There is guidance available on narrative reviews by Cochrane handbook, York University and other sources. The guidance used in this review is from York University and methods opted for search of literature is based on the following:

i. Type of participants: adults aged 18 years and above both genders with learning or intellectual disabilities and associated conditions.

ii. Type of interventions: preventive dental interventions: clinical on individual basis or in dental and community based settings such as the oral health program, training of caregivers and dental professionals.

iii. Type of outcome measure: evaluate effectiveness of the clinical and community based preventive dental measures and identify the gap in knowledge in areas of periodontal disease, gingivitis, caries, poor oral hygiene, pain and discomfort, loss of activities of daily living (ADL), not being able to visit the dentist, improper brushing or inadequate brushing and lack of training of caregivers and dental professionals.

iv. Type of studies: The types of studies included in this review are interventional studies, prevention studies, clinical trials, pilot studies and randomized control trials on humans.

v. Type of Search: Literature Search with the key words: “special needs,” “special care dentistry,”-“disability,”-“intellectual disability,”-“learning disability,”-“mentally handicapped adults,”-“autism,”-“Down syndrome,”-“preventive dental interventions,”-“fissure sealants,”-“fluoride varnish,”-“fluoride therapy,”-“topical fluoridetriclosan,”-“chlorhexidine,”-“tooth brushing, caries prevention,”-“periodontal disease prevention,”-“oral health programs,”-“oral health interventions,”-“oral health education,”-“behavior and cognitive therapy in dental care,”-“training of caregiver and dental professionals.”

Review of Literature; Author search; systematic and narrative reviews, through the following electronic databases via UFP library services.

- Pub-Med.
- Medline.
- EMBASE.
- CINHAL
- Google scholar.
- Science Direct; Social and Medicine.

A comprehensive search of all available literature from 1990-2015, including systematic reviews, policy documents and some guideline documents was done. Internet resource used to access; Department of Health, World Health Organization, Disability World, Disability Rights Commission, the Stationery office, MENCAP, Australian Learning Disability Association.

The literature search was carried out with single word, combined words and phrases, authors' names and the title of literature search.

7. Inclusion criteria:

Selection criteria were employed as follows;

- Literature published in English language.
- Literature published in other parts of the world regarding preventive dental diseases in adults aged 18 and above with learning or intellectual disabilities.
- Literature published between the chosen periods of research 1990-to date.

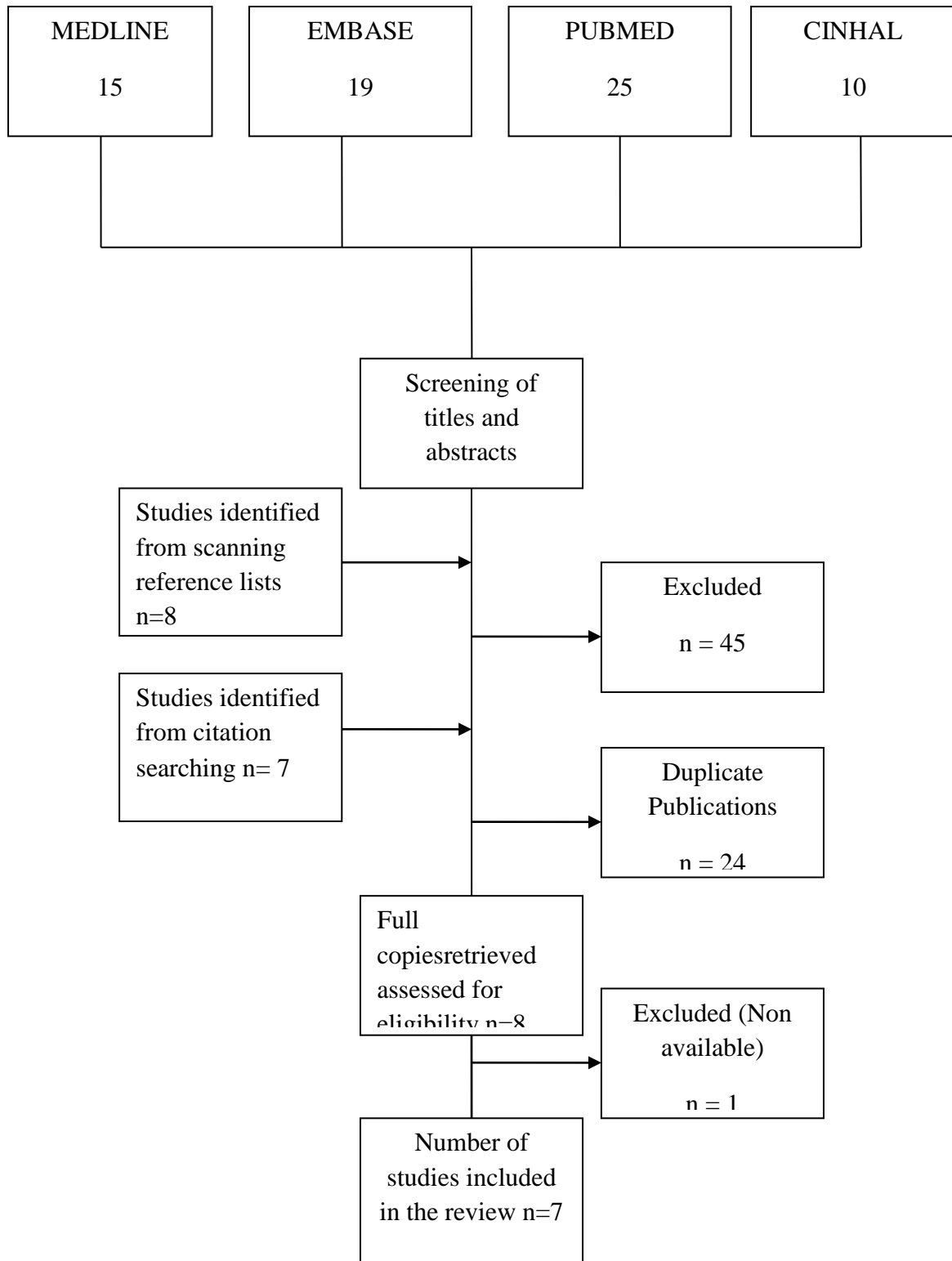
- Studies or articles exclusively written for “adults with learning disabilities” in relation to preventive dental measures.
- Training program for dental professionals and the caregiver are included to evaluate its effectiveness in dental disease prevention.

8. Exclusion criteria:

- Literature on general or other disabilities was excluded.
- Literature on children with learning or intellectual disabilities and disorders was excluded.
- Psychotherapy, drugs intervention and child abuse was also excluded as these topics are beyond the scope of this narrative review.
- Conference proceedings and commentaries.
- Individual case studies.
- Policy and guidelines.
- Trials.

Through the UFP library services various journals, articles and literature was searched; Journal of Intellectual Disability Research, Journal of Learning Disability, Special Care Dentistry, Journal of Dental Research, Journal of Clinical Periodontology and Journal of Community Dentistry and Oral Epidemiology.

Figure: 2.1. Flow chart of study process



A total of 69 articles and publications found in the primary search for titles and abstracts, which are as follows;

- Articles (42)
- Reviews (7)
- Conference proceedings (4)
- Case Studies (2)

By applying the inclusion and exclusion criteria; 27 articles and review publications were excluded and 15 were included primarily after screening and scanning for reference lists and citation searching 14 articles were shortlisted to refine the search. Only 10 articles were available with full text. Three papers were dropped because of there was no or partial intervention measures used. One paper was obtained through library loan scheme; one paper was bought online as full text was not available online. The review is carried out by one person and is focused to qualitative analysis of literature.

9.Results:

Seven studies were successfully found and included in the review, categorized in clinical and community based preventive dental interventions. There are two articles found in clinical preventive dental interventions and eight community based dental interventions were retrieved. These studies confirm the disparity in oral health among the people with learning disabilities.

After screening 69 searched articles and publications obtained through the electronic databases. The 8 studies were retained following scanning of titles and abstracts, reference lists and citation searching, 7 studies was considered for this narrative review.

10. Description of Studies:

The reviewed studies were classified as community and clinical based preventive dental interventions, illustrated in table 4.

Table 4: Description of studies

Preventive Dental Interventions	
Community based	Clinical
Glassman and Miller 2006, Zigmond et al.2006, Burtner et al. 2003 Pannuti et al. 2003, Shapira et al.1994, McKenzie et al. 1992	Mori et al. 2000

11. Preventive dental interventions; community based:

11a. Effect of Preventive Dentistry Training Program for Caregivers in community facilities on caregiver and client behavior and client oral hygiene – Glassman & Miller, 2006.

Description of the study

This interventional multi baseline study was conducted to evaluate effectiveness of an indirect training to the caregivers and to assess the effect of specific knowledge of caregivers' and, its impact on the oral health behavior of their clients with developmental disabilities across three group homes. It was anticipated that training caregivers would improve oral hygiene of clients enabling longer duration of tooth brushing, reducing plaque scores.

Data was collected and graphed, measurement for trend analysis in each phase and efficacy of treatment was tested with the dependent variables.

The participants were residents of a care home in North Carolina. The study sites were situated in three different cities referred in article as; #1, #2 and #3. The group home #1 had three clients and two caregivers participated, from the home #2 two caregivers and two clients were included, from home #3 six caregivers and six clients joined the study making a total of 11 clients and 10 caregivers.

Inclusion criteria were defined for clients and caregivers: proficiency in English language was one of the criteria, the clients were to have moderate to poor tooth brushing skills and who could tolerate teeth examination, all patients to have at least 8 upper and 8 lower teeth present, no large cavities were present and asymptomatic to pain. Caregivers were awarded certificates as professional development incentive; patients remained in the study for 5 months.

The caregivers were given specific training in preventive dentistry and applied behavioral principles. The training was called “overcoming obstacles to dental health.” Training was held at three different sites at varied times by two instructors in each session comprising of two classes, three hour each, and knowledge was tested pre and post training by a questionnaire. Additionally trainers completed 10 hour review and practice in preparation of the training and was consistently maintained at each training class. Field observations were continued after the caregivers were trained using same procedures as was used at the baseline. Field observers provided a feedback based on the training material used with supportive suggestions to caregivers during this phase and gave verbal directions to coach. From baseline till the conclusion of the coaching it was 154 days in city #1, 142 and 156 days for city #2 and #3 respectively.

The clients were observed for tooth brushing activity and recording was done on video tapes by two dental assistants and one dental hygienist who were trained as field observers and an additional two people to judge the quality of the collected data. The filming was done pre and post training of the caregivers and effects of their presence was noted to compare results.

Data was pooled for participants from each home separately and mean score per house was calculated. The presence of caregivers, percentage of tooth surfaces brushed and the duration of tooth brushing coupled with plaque score were noted and analyzed.

At the base line caregivers were blinded from purpose of study and no instructions were given on oral hygiene, brushing techniques, neither were they informed regarding the research project. During the observation sessions observers didn't comment to maintain neutrality. The observers collected plaque score from the client's mouth under a headlamp with a mouth mirror and periodontal probe.

The result of training and coaching increased presence duration of caregivers from 63% at baseline to 93% after training and 100% in the coaching in city #1, for city #2 from 25% at baseline to 88% after training and 100% during coaching and for city #3 it was 11% at baseline that rose to 93% and 100% during coaching. Duration of brushing at baseline ranged between 20.5 to 73.8 seconds. After coaching it ranged between 57.9 to 215.4 seconds. The mean difference from baseline to coaching phase was 34% to 518%. In city #1 there was no

difference in brushing time, in city #2 improvement started soon after training and in city #3 it improved after the six-hour training and further improved during coaching step. Likewise there was an improvement in plaque control from baseline range 2.1-1.0 to 1.6- 0.3 at the coaching stage and a represented improvement from 18.8% to 72.5%. The results of plaque scores in each home were similar to the tooth brushing.

Table 5: Characteristics of study no. 11a.

Glassman and Miller, 2006		
Methods	Single blinded, training intervention, 3 groups and 5 months.	
Participants	11 clients and 10 caregivers, assigned in three groups:Gp#1 =5, Gp#2= 4, Gp#3= 12. No gender explained. Adults no age range given	
Intervention	Training program devised for the caregivers and the tooth brushing skills were recorded on a video tape for the clients of all three groups expertise of caregivers observed.	
Risk of bias: study possess risk of; selection, reporting and detection biases.		
Item	Reviewers' judgment	Description
Randomization	No	Not reported
Allocation Concealment	Unclear	Not reported
Blinding of outcome assessors	Unclear	Insufficient information
Other: Blinding intervention providers	Yes	Based on the given information
Overall Quality Assessment	The overall quality of the study is graded poor.	

Quality Analysis:

No detail was given, how the selected sample was allocated in groups which makes it liable to selection bias. The caregivers believed that 8 clients out of 11 benefited from their support after training and their oral hygiene skills were improved. However, dexterity and knowledge of patients at baseline is not reported which may lead to reporting and analytical bias of

observer. The Simplified Oral Hygiene Index (OHI-S) used to measure amount of debris and plaque. The content validity is good though face validity is questionable. The quality of the study is poor and better methodology is required to assess effectiveness of the program. Overall reliability of the study is assessed as claimed by the authors, though generalizability is poor. No funding or registration details given.

11b. The outcome of a preventive dental care program on the prevalence of localized aggressive periodontitis in Down's syndrome individuals. Zigmond et al 2006.

Description of the study:

This is a study to evaluate effectiveness of a 10 year preventive dental program and its impact on the periodontal health of participants having Down syndrome (DS). The program included oral hygiene instructions given to the caregivers though not much detail of program is given, supra and sub gingival scaling provided every 6 months by trained dental hygienist.

The study aims to assess the oral hygiene status, periodontal and gingival condition of the participants by measuring periodontal probing depth (PPD), clinical attachment level (CAL) and the radiographic alveolar loss. The desired aims were assessed by clinical and radiographic examination. Mesial and distal aspects of the teeth were measured by Vernier calipers to the nearest 0.1mm. The radiographic bone loss (RBL) was assessed by 2 bite-wings and 2 anterior periapicals with a positive finding at RBL > equal to 3mm.

The study includes a random sample of 30 adults with DS as cases with one person on phenytoin and 15 DS people had hypothyroidism with mean age 23.3 +/- 4 years, comprising of 13 females and 17 males from Elwyn Center for the Disabled in Jerusalem, Israel either as full timers or residents living in apartment like accommodation. The individuals with DS possessing cardiac anomalies were given prophylaxis for infective endocarditis (IE) one hour before periodontal examination started. There were 28 healthy controls recruited with mean age of 22.8 +/- 5 years constituting of 19 females and 9 males comprising of students and faculty of Dental Medicine in Jerusalem. No age match between the two groups.

No precise inclusion or exclusion criteria given. All participants provided informed consent for the study in case of DS subjects consent was obtained from parents or guardian. The controls were asked to provide medical history to confirm absence of any systemic disorder or if they were taking any medication that may effect on their periodontal health. Only 51% had received scaling and root planning treatment in the last 6 months, which is not comparable to cases as they had regular excellent attendance since they were in the program.

The clinical examination was observed by two examiners who are the authors of this article (A.S and M.Z), they used a mouth mirror (UNC-15) and a periodontal probe. Eight teeth were examined in each participant permanent upper and lower central incisors and all first permanent molars. The periodontal health was evaluated by presence or absence of bleeding on probing (BOP) on a dichotomous scale at six sites per tooth (mesio-buccal, mesio-lingual, mid-buccal, mid-lingual and disto-buccal, disto-lingual) expressed in percentage values, and pocket periodontal depth (PPD) and gingival recession (distance between cemento-enamel junction and gingival margins) measured the same as the BOP and the clinical attachment level (CAL) calculated as the sum of PPD and recession, if the CAL is \geq 5mm a tooth would be considered periodontally affected even if it is on one site of the tooth surface. Periodontitis was determined with one positive finding on any of the site. The mean CAL and periodontally affected sites and teeth were calculated for each individual. The number of lost teeth due to periodontitis was also recorded.

The results showed four of DS subjects couldn't tolerate the clinical examination due to lack of cooperation, in the control group radiographs were available for 23 out of the 28 patients, however compliance of DS subjects in radiographic examination is not mentioned. In the DS group 7 individuals 23% cases had lost at least one tooth due to periodontitis, six people were found partially edentulous and one completely edentulous. The findings were different in control group as they were fully dentate. The findings were statistically significant ($p < 0.01$).

Mean plaque scores were same in both groups with 'p' value = 0.6. The mean BOP of the DS group was 1.5 times greater than control group but not statistically significant. There was no significant difference in periodontitis status, percentages of affected upper incisors and molars were greater as compared to the control group but not statistically significant. The percentage of affected lower first molars among both groups was similar, and in the upper first molars was a significant difference when tested by a chi2 test indicating 'p' value 0.03.

In the radiographic examination the DS subjects possessed greater mean radiographic alveolar bone loss than controls, teeth and sites as calculated by radiographs of the DS group were far greater than controls. No statistical differences were between genders.

However, it can be depicted from the study that preventive dental program cannot prevent periodontal destruction in the DS individuals. The clinical and radiographic evidence suggested close resemblance to localized aggressive periodontitis. It's rather an immunological defect in the DS individuals which makes them more susceptible to periodontitis where oral hygiene plays a negligible role in its pathogenesis.

Table 6: Characteristics of study no. 11b.

Zigmond et al, 2006		
Methods	Single blinded intervention study. 2 groups and 10 years	
Participants	30 cases with DS+28 healthy controls without DS. Both gender included	
Intervention	Clinical and radiograph examination to assess the outcome of a 10 year preventive dental program	
Outcome	Improved oral hygiene had negligible role in reducing the pathogenesis of periodontitis in adults with DS	
Risk of bias: study possess risk of; selection, reporting and detection biases.		
Item	Reviewers' judgment	Description
Randomization	No	Not applicable
Allocation Concealment	No	Not applicable
Blinding of outcome assessors	High risk	Faculty members and students of Dental Medicine
Other: Attrition bias	Medium level risk	Non compliance and drop outs
Overall Quality Assessment	The overall quality of study is graded as poor.	

Quality analysis:

There is a potential for detection bias due to the induction of faculty members in controls and a possible selection bias. Ambiguity between clinical and radiographic measurement is bound to inaccuracy in measuring periodontal probing especially in non compliant DS individuals and a tendency of reporting bias to the drop outs. It is difficult to assess the effect of preventive dental program because of lack of baseline data. No details about calibration and training are provided. No age match or randomization details of cases and controls are mentioned. The validity and reliability of the study is low and graded as poor.

11c. Effects of chlorhexidine spray on plaque and gingival health in institutionalized persons with mental retardation -Burtner et al, 2003.

Description of study:

This is an intervention study over 4 weeks to assess the effects of chlorhexidine; a chemical antiseptic in a spray form on the gingival health of adults with mental retardation (MR).

The study is conducted on 16 institutionalized men with MR with severe and profound MR aged between 28 and 45 years randomly assigned to two groups 8 in each group; one group 0.12% and the other group on placebo spray. The inclusion criteria was; subjects should display reasonable level of cooperation to enable data collection without use of sedation, should not have hepatitis B, be all males to avoid the hormonal interaction with chemicals in use, they should have at least 4 anterior teeth present in each arch upper and lower, should have moderate to heavy accumulation of plaque and moderate to severe gingivitis, and should have a legal guardian to give informed consent.

One group was administered 0.12% chlorhexidine gluconate solution (Peridex[®]) in spray form whilst, the other was given a placebo spray. To ensure that baseline values reflects exact state of oral hygiene condition of the subjects no prophylaxis was given prior to intervention

administration, neither were any changes made to their daily oral hygiene program. The two solution bottles were covered to protect contents from light and to mask them from nurses. The nurses administered these in daily rounds at 7:00am and 7:00pm in which 2.4 ml of the solution were sprayed on facial surface of the anterior teeth and associated gingiva of the subjects. This quantity was chosen as it's the one-sixth of usually prescribed dose of chlorhexidine mouth rinse. To ensure that solutions are administered accurately prescriptions were written for each participant. These solutions were dispensed with a calibrated spray to deliver 1.2 ml. The extent of plaque accumulation and the condition of gingival tissues were evaluated by plaque index of Silness and Løe, and a modified gingival index of Løe and Silness was used whereas, the tone, color and bleeding of gingival tissue with a mirror, periodontal probe and an explorer. There was only one examiner that completed each assessment in 5-15 minutes depending on the compliance towards treatment, who was proficient with treating MR patients and consistent for 4 weeks of the study period.

The results reveal similar findings in both groups for plaque accumulation, gingival color, gingival tone and gingival bleeding at the baseline. However, a significant improvement was observed after 4 weeks in first group that used 0.12% chlorhexidine spray with a 35% reduction in plaque whereas, placebo group showed no effect. The baseline scores for both; chlorhexidine and placebo was recorded as PI=2.5 and PI=2.3 respectively which is indicative of moderate to severe accumulation of plaque on the anterior teeth surfaces. The effects of chlorhexidine prevailed 4 weeks post usage in reducing plaque and improving gingival health, when tested statistically gingival color, tone and gingival bleeding was significant with 'p' value of 0.09, 0.02 and 0.03 respectively.

Table 7: Characteristics of study no. 11c.

Burtner et al, 2003		
Methods	Double blinded, interventional study: 2 groups and 4 weeks.	
Participants	16 subjects with mental retardation assigned in two groups:Gp#1= 8 received 0.12% chlorhexidine spray. Gp#2= 8 received a placebo. Adult Males aged18-45yrs	
Intervention	To evaluate the effectiveness of an antimicrobial agent chlorhexidine spray in people with MR to reduce plaque and gingivitis	
Outcome	Chlorhexidine spray proved beneficial in reducing gingivitis and reducing plaque, spray form 1/6 th of the recommended dose produced better results, more acceptable, less adverse effects of associated with the agent.	
Risk of bias: the study could have a funding bias due to its sponsors.		
Item	Reviewers' judgment	Description
Randomization	Yes	Block randomization
Allocation Concealment	No	Not reported
Blinding of outcome assessors	Yes	No details given
Other: Blinding of patients and intervention providers	Yes	The Nurses who provided intervention and the MR groups
Overall Quality Assessment	The overall quality of study is poor due to absence of any statistical test and a potential of funding and observer bias.	

Quality Analysis:

It is difficult to rely on the accuracy of collected data as only the anterior segment of teeth was included. The extent and process of training to nurses is not elaborated. Considering the severe and profound MR in the selected subjects compliance and tolerance to spray from administration to examination is not mentioned, and ingestion of antiseptic agent is a

possibility too. No statistical tests shown in the paper. The study possesses low reliability and high risk of funding and observer bias.

11d. Efficacy of 0.5% chlorhexidine gel on the control of gingivitis in Brazilian mentally handicapped patients by Pannuti et al, 2003.

Description of study:

This is a double blinded randomized control trial done to assess the effectiveness of 0.5% chlorhexidine gel in reducing inter dental gingival bleeding in institutionalized mentally handicapped subjects.

Inter dental bleeding index (IBI1) was used one day before the gel was applied and the plaque control data was recorded. Bleeding was assessed in all areas except between 2nd and 3rd molars.

The study is conducted in 'Casa Andre Luiz' Hospital in Guarulhos, Brazil, an institutional where about 700 people with mental handicap live. 43 patients including 27 males and 16 females aged between 18 and 35 years were included. In the selected sample 41% were severe mental deficiency MD, 37% moderate, 18% mild and 2% profound. Selection was based on possessing 20 natural teeth, severe periodontal disease pockets \geq equal to 6mm were excluded. No participants had any history of sensitivity or adverse reaction from any toothpaste. The ethics was approved. Participants were randomly assigned to test group = 22, that used 0.5% chlorhexidine gel and the controls = 21, that used placebo-quinine sulphate gel. The subjects were examined three weeks prior to the test for the plaque assessment and before initiation of study community periodontal index treatment need (CPITN) was used to assess presence of periodontal disease. Followed by a prophylaxis and scaling to all participants and the oral hygiene instructions to the caregivers and revised a week later. Inter examiner calibration was done. All participants received the gel for 8 weeks by a dental hygienist twice a day in flexible disposable trays (Oral-B) a volume of 12 ml of the gel was dispensed. By the end of the period another second examiner performed an examination

without the previous examiner and found similar finding a second IBI score IBI2 was recorded; major outcome of the study was ‘whole mouth bleeding index’. A Student’s t-test was performed to check differences between IBI in both groups and a paired t-test were carried or to assess IBI means in each group pre and post intervention.

The most frequent finding had CPITN code 3, graded as severe periodontal condition. Scaling and prophylaxis improved the plaque control in both groups and was no significant difference found. After the 8 weeks observation period the IBI means in test group decreased whereas, the control group showed an increase and towards the end of study the two groups showed a significant difference ($p < 0.001$).

Table 8: Characteristics of study no. 11d.

Pannuti et al, 2003		
Methods	Double blinded, RCT of 2 groups in 8 weeks	
Participants	43 handicapped patients with gingivitis, in two groups:Gp#1Chlorhexidine gel = 22, Gp#2 placebo gel= 21. Of which 27 males and 16 females, Adults 18-35 years	
Intervention	To evaluate the effectiveness of 0.5% chlorhexidine gel on control of gingivitis	
Outcome	The chlorhexidine gel was found to be beneficial	
Risk of bias: no details of funding and registration.		
Item	Reviewers’ judgment	Description
Randomization	Yes	Not reported
Allocation Concealment	No	No details given
Blinding of outcome assessors	No	Not reported
Other: Blinding of patients and intervention providers	Unclear	Ambiguous
Overall Quality Assessment	Good study design with reporting bias	

Quality Analysis:

Results depict that 0.5% chlorhexidine gel reduces inter dental gingival bleeding. No information on funding and registration is found. Biases in reporting as the care givers used to be alone on weekends the application of gel and tooth brushing.

11e. Clinical and microbiological effects of chlorhexidine and arginine sustained varnishes in the mentally retarded by Shapira et al, 1994.

Description of study:

The study is an interventional controlled pilot study held in an institution in Jerusalem, Israel to evaluate effectiveness of antimicrobial agents' chlorhexidine and arginine varnishes in adults with mental retardation (MR). In the study chemotherapeutic agents are used for plaque control among disabled people. The authors prefer use of these rinses to interfere with plaque film on a microbiological level to disintegrate it. This is applied as a sustained release delivery system varnish by a trained hygienist.

The study randomly assigned the 34 MR patients, 11 females and 23 males aged 18-45 years selected from 240 residents of an institution in one of the following group after fulfilling the criteria:

Group 1: experiment group used chlorhexidine was called 'C' had 11 subjects.

Group 2: experiment group used arginine was called 'A' and had 11 subjects.

Group 3: controlled group called 'P' used the placebo and had 12 subjects. The placebo liquid varnish contained polymer and solvent.

The participants were assigned three-digit reference numbers in all the three groups these numbers corresponded to the three varnish bottles.

The Inclusion criteria were; they should be healthy with no history of any other chronic illness except for the mental deficiency, however the level of mental deficiency is not mentioned. They should all be able to sit still on a dental chair during the treatment. No dental treatment in the last three months and they should all have had a supra and sub gingival scaling in the last one month prior to the start of study. Dentition requirement was at least 20 functional teeth for the varnish application and evaluation.

The plaque dissolution was done by topical application of 1.6% chlorhexidine and 3% arginine. A sustained release delivery system (SRD) was used for its release on the tooth surface by a slow frequency and low dosage. Chlorhexidine and arginine were embedded in a matrix of ethyl cellulose polymer in the SRD. Arginine (an amino acid) releases ammonia and resists metabolism of *Strep. mutans* and has a catabolic effect by reducing the plaque pathogens and counteracts with the acids produced by the carbohydrate metabolism. The sustained release delivery system (SRD) was applied daily for eight weeks on the buccal and labial surfaces of the selected participants with gingivitis.

Plaque Index Silness and Løe and the Gingival Index of Løe and Silness were used before the start of study to evaluate baseline recording for each participant. The participants received a scaling by registered dental hygienist at the start followed up by daily brushing for 4 weeks by senior dental students until PII and GI scores reached 1.0, no oral hygiene instructions were given at any stage of the study. No interference daily oral hygiene activities were made.

The baseline PII and GI were recorded at the first step after scaling and professional cleaning and then at one, two, four and eight weeks subsequently. The clinical indices were then recorded from the selected teeth 7, 10, 13, 24, 27, 29 and 30 and the results were pooled. All clinical examinations were carried out by single operator (J.G) every morning after breakfast.

Statistical method used in the study was Kruskal-Wallis one way ANOVA which was appropriate to assess significant difference in the three treatments. The Mann-Whitney U-test was later used to test differences within each group and the p value < 0.05 and statistically significant.

Results of the study were taken on baseline and PII for effect of SRD and buccal surfaces of the anterior teeth were identical for all three groups with a gradual rise on each stage of the study at week 1, 2, and week 8, from 2 to week 8 there was a moderate increase. At week 4 the group C possessed the lowest scores, which was highly significant as compared to the placebo group and significantly low at week 8, group A was not different than the placebo group at 8 weeks. Whereas, GI remained the same in all the three groups all throughout the study. Microbiological effects were; C group showed significant reduction in *strep. mutans* and the same in group A in addition an increase in streptococcus viridians seen in group A.

Table 9: Characteristics of study no. 11e.

Shapira et al, 1994		
Methods	Double blinded, intervention pilot study of 3 groups in 4 weeks	
Participants	34 MR patients with gingivitis, assigned in three groups:Gp#1(C)= 11, Gp#2(A)= 11, Gp#3(P)= 12 out of which 23 males and 11 females, Adults between 18-45 years	
Intervention	To evaluate the effectiveness of chlorhexidine and arginine sustained-release varnish in the mentally retarded (MR)	
Outcome	Antimicrobial agents have beneficial results in plaque control in MR	
Risk of bias: high risk of reporting bias		
Item	Reviewers' judgment	Description
Randomization	Yes	Randomly assigned
Allocation Concealment	Yes	participants had a three digit number
Blinding of outcome assessors	Yes	Details given
Other:	Validity and reliability low	N/A
Overall Quality Assessment	Study methodology is good with high risk of biases.	

Quality Analysis:

The study has limitations for generalisability, and response bias due to dropouts, study funded by a periodontal products company and there could be observer and funding bias too. The reliability and validity of the study is questionable, since author reports inaccuracy in varnish application at the night time due to the lack of cooperation and tiredness of MR participants reporting bias is also a possibility.

11f. Comparison of a 0.12%chlorhexidine mouth rinse and an essential oil mouth rinse on oral health in institutionalized, mentally handicapped adults: one year results - McKenzie et al, 1992.

Description of study:

This is a quasi-experiment and the efficacy of 0.12% chlorhexidine (Peridex®) and essential oil (Listerine) is evaluated in mentally handicapped people of an institution called 'Cottonwood Manor' in Yukon, Oklahoma, USA, an immediate care facility for mentally handicapped.

The sample was of 29 clients aged between 25 to 64 years participated in the study out of 106 people who lived at the institution 77 people were excluded due to: edentulism, antibiotic usage, having less 10 teeth, or profound retardation and those who were bed ridden. The subjects were 7 males and 7 females were in the chlorhexidine group 'A' and the 8 males and 7 females were then allocated to the essential oil rinse group 'B' were randomly assigned.

The Inclusion criteria were: they should have at least 10 teeth present, be able to swish the mouth rinse without swallowing, expected to reside at the facility throughout the study. Should not have; allergy to any chemicals that may or use of antibiotics in the last three months or otherwise in their dental treatments. They should not have any oral ulcer or lesion. The study was approved by the Universities' Institutional Review Board. There was only one examiner (WM), who is one of the authors who remained blinded from the treatment group.

The groups were divided on the basis of age and gender >40 and <40. Gingival Index of Löe and Silness was used on facial (mesio-facial, midfacial and distofacial) and all lingual surfaces of all teeth were recorded as well. And the means were tabulated to take out an average. Color coded probe KM-0805 was used to measure the bleeding index

The baseline GI, PI and PD were noted and a scaling was done at the start. The soft tissue readings were taken except for the third molar. Two weeks post baseline the subjects were reassessed. Participants used the rinse morning and evening after meals, and they carried their oral hygiene activities as per normal for which no regular routine is mentioned. The study was conducted for one year and two patients were withdrawn from the study leaving 13 in essential oil and 14 in the group A. Statistical methods used were ANOVA for a two factor analyses.

Study depicts PI and GI was measured monthly for 12 months while PD recorded at baseline 1, 2 and 12 months. The pocket depth was reduced as shown by the statistical analysis but no significant change to PI and GI, both mouth rinses proved beneficial for GI after one month of use and a statistically significant improvement was seen in PI after use of chlorhexidine rinse after month one which returned to baseline 2 levels over the 12 months. Hence, no significant improvement in gingival condition from the use of either of the rinses was seen.

Table 10: Characteristics of study no.11f.

McKenzie, 1992		
Methods	Double blinded, quasi experiment on 2 groups for 12 months	
Participants	29 mentally handicapped people, divided in two groups: Gp#1 Chlorhexidine=14, Gp#2 Essential oil=15. Of which 15 males and 14 females are adults aged 25-64 years	
Intervention	To evaluate the effectiveness of mouth rinse in mentally handicapped	
Outcome	No significant results	
Risk of bias: Superiority trial, possibility of funding and reporting bias.		
Item	Reviewers' judgment	Description
Randomization	Yes	Reported- sample selected from 106
Allocation Concealment	Unclear	Assigned to blocks on the basis of age and gender.
Blinding of outcome assessors	Yes	
Other: Blinding of patients and intervention providers	Yes	
Overall Quality Assessment	Study design is good with reporting and funding bias	

Quality Analysis:

The study does not explicitly illustrate training and calibration of the examiner. No detail of consent is provided and a high risk of reporting and funding bias is possible.

12. Preventive Dental Intervention: clinical based

12a. Effects of short professional mechanical tooth cleaning (PMTc) program in young adults with mental disabilities by Mori et al 2000.

Description of study:

This is an intervention study to evaluate usefulness of professional tooth cleaning program (PMTc) in reducing periodontal conditions and caries in adults with mental disabilities. The study was conducted at Division of Special Care Dentistry, Osaka University Dental Hospital.

Ten adults with mental disabilities (one female and nine males) were recruited aged 21 to 29 years, Inclusion criteria suggested: subjects with periodontitis, having mental retardation of varied degree, autism and hydrocephalus and one also had a physical disability. All participants provided informed consent and those who were unable to give consent; their parents or guardians consented to participate in the program. Individuals who had decayed or missing teeth were excluded from the study.

The pocket probing depth (PPD) and bleeding on probing (BOP) was measured at six selected tooth sites (mesial, middle, distal, both buccal, lingual). Axelsson's method was used strictly for the PMTC. Participants were examined, photographed, impressions and bite-wing radiographs were taken, supragingival scaling was carried out 2 weeks before the PMTC and subjects received.

The subjects dentition were divided into six sextants (segments) in PMTC evaluation, divided as; anterior: canine to canine, left premolars and molars and the right posterior sextants in each arch. Six teeth (14, 21, 24, 36, 41 and 44) in each subject were selected as representative of each sextant. These teeth were coated red and debris index (DI) was used, in case of a missing tooth the next distal tooth was considered. Periprobe[®] an automatic probe was used to record pocket depth. PMTC in one specific sextant each visit, every two weeks for a total of 6 visits. The subjects had an oral examination 6 and 14 weeks post PMTC. Six of the participants were able enough to perform tooth brushing for them and four were dependant

for oral care. However, there was no improvement seen in brushing techniques or DI. Hence, PMTC was proposed which didn't significantly change oral care.

The effectiveness of PMTC program was measured by four indices in each subject pre PMTC and 2 weeks post PMTC program. Results suggested reduction in BOP and DI values with no significant effect on *cariostat*[®] (caries susceptibility measure) on subjects. PMTC was found to be significantly effective as t-test revealed 'p'- value < 0.05 and effectively reduced probing depth in 8 participants out of 10. Whereas, BOP was decreased on all 10 participants and 'p' value < 0.05 which shows statistical significance. DI values were also significant 'p' value, 0.05 in 9 out of 10 participants. In only one individual improvement in DI was not seen 2 weeks post PMTC. PMTC was found effective especially in reducing gingival inflammation and its effect lasts only for 6 weeks post treatment.

Table 11: Characteristics of study no.12a

Mori et al, 2000		
Methods	Single blinded, intervention study in 2 groups for 6weeks	
Participants	10 adults with mental disabilities of which, 1 female and 9 males all adults aged 21-29	
Intervention	To evaluate the effectiveness of a short professional mechanical tooth-cleaning (PMTC) program.	
Outcome	PMTC is effective.	
Risk of bias: Reporting bias		
Item	Reviewers' judgment	Description
Randomization	No	Not reported
Allocation Concealment	No	No details
Blinding of outcome assessors	Not clear	No details
Other: Blinding of patients	Yes	Details given
Overall Quality Assessment	The methodology is poor and high risk of bias	

Quality Analysis:

There are limitations due to improper randomization and risk of reporting bias.

Summary of results:

The overall assessment of the studies reviewed is poor, some possess high risk of bias and some had improper methodology and a low quality of reporting. The cardinal features of these studies are given in Table 3.9 and the reviewer’s opinion on judgments of risk of bias is given in Table 3.10.

Table 12: Summary of methodological quality of included studies

Criterion	Reported/ Yes	Reported / No	Unclear
Randomization	Glassman and Miller. 2006, Zigmond et al.2006, Burtner et al. 2003, Pannuti et al. 2003, Shapira et al.1994,McKenzie et al. 1992	Mori et al. 2000	
Allocation Concealment	Glassman and Miller. 2006, Shapira et al.1994, Mori et al. 2000	Zigmond et al. 2006, Burtner et al. 2003,Pannuti et al. 2003	McKenzie et al. 1992
Blinding of participants	Burtner et al. 1999, Shapira et al.1994, McKenzie et al. 1992, Mori et al. 2000	Pannuti et al. 2003	Glassman and Miller. 2006, Zigmond et al.2006
Blinding of intervention providers	Glassman and Miller. 2006, Burtner et al. 2003, Shapira et al.1994, McKenzie et al. 1992		Zigmond et al.2006, Pannuti et al. 2003.Mori et al. 2000
Blinding of data collectors/ outcome assessors	Burtner et al. 2003, Shapira et al.1994, McKenzie et al. 1992	Zigmond et al.2006	Glassman and Miller. 2006, Pannuti et al. 2003, Mori et al. 2000

Table 13: Reviewer’s judgment of risk of bias

Type of bias	Low Risk	Medium Risk	High risk
Selection Bias		Mori et al. 2000	Glassman and Miller. 2006, Zigmond et al.2006
Reporting Bias			Glassman and Miller. 2006, Mori et al. 2000, McKenzie et al. 1992, Zigmond et al.2006, Pannuti et al. 2003, Shapira et al.1994
Detection Bias		Mori et al. 2000	Zigmond et al.2006
Analytical Bias		Burtner et al. 2003, Shapira et al.1994	Glassman and Miller. 2006, Zigmond et al. 2006
Attrition Bias		Mori et al. 2000, Zigmond et al.2006	
Funding Bias		Burtner et al. 2003	McKenzie et al. 1992

13. DISCUSSION:

i. Summary of the Key findings:

The results of the seven studies that are reviewed establish that preventive dental interventions have helped reduce plaque index and increased oral hygiene and have contributed in improving gingival and periodontal health in adults with learning or intellectual disabilities. However, the overall quality of the literature assessed is poor. Six of the studies are community based interventions and only one is clinical based. The community based studies are; (Glassman and Miller. 2006, Zigmond et al. 2006, Burtner et al. 1991, Shapira et al. 1994, Pannuti et al. 2003 and McKenzie et al.1992) and the only clinical based

study is: Mori et al. 2000. The validity and reliability of the above studies is generally weak. This is because of the poor study design and inaccuracy in measuring the effectiveness of the particular preventive dental interventions chosen to be researched. There is a gap of knowledge in understanding learning disabilities and their behaviors towards dental treatments and trials. Most researchers have selected individuals with varied range of developmental disabilities with difference in understanding, abilities, dexterity and compliance leading to incomparable groups and ambiguous results. A consensus needs to develop on defining learning or intellectual disabilities in order to classify each disability group individually to develop understanding about propensity of behaviors in general and towards oral health.

The existing evidence is insufficient to set benchmark of preventive dental practice. However, policy guidelines as Oral Health & Disability: the way forward, 2005 reiterates on developing understanding and defining special needs and each disability independently to enable professionals devise right support strategies. It recommends training families, caregivers through dental hygienist and oral health promoters in oral health care, and integrating oral health in the general health care plan. To recruit more number of public health staff to promote oral health. Professional development courses for dental team.

Another Clinical guidelines & integrated care pathways for Oral health care in people with Learning Disabilities, 2001 recommends; educating parents, caregivers and professionals in improving brushing and oral hygiene of people with learning disabilities to prevent dental diseases. It also emphasizes on diet and caries prevention, fluoridation of water, fluoride use in toothpaste, supplements and therapeutic application.

There are gaps between policy and practice which can be bridged by good quality research which may establish evidence to develop preventive dental interventions for learning disabilities.

ii. Strengths of the Review:

This review is unique and the first of its kind, though there are systematic reviews found for prevalence of dental diseases in adults with learning disabilities but none found on the preventive dental interventions. The process of extracting literature is rigorous and assessed against criteria of inclusion to reduce bias. The review highlights evidence and establishes correlation to the policy.

iii. Limitation of the Review:

There is a limited literature found on the subject of research. The term “learning disability” is not widely hence, searching literature was difficult and there is a chance of error or missing some important studies. Articles written in English language was one of the criteria that again could be a possible limitation. Shortage of resources in terms of time allocated for research and unavailability of full text for some other studies.

III. CONCLUSION

There is a gap of knowledge identified in not having ample research in the area of preventive dental interventions in adults with learning or intellectual disabilities and there is a need of more research. Understanding learning disabilities and to identify their behavior, compliance and oral health needs is paramount for all professionals working with or for them at each level.

Considering the deficits that this review has high lightened, I would like to propose the following conclusions to develop better preventative strategies to improve dental health in adults with learning disabilities:

- Improve robust research of better quality to establish authentic reference to assess the existing and develop new preventive dental measures to improve the oral health in adults with learning disabilities that may benefit policy and practice.
- Studies need to be of a better quality and a special consideration is required in the community settings where maintenance of oral hygiene for this vulnerable group of society is hugely dependent on their caregivers.
- There is partnership to be established between the academia, professionals and the policy makers to form evidence based preventive strategies.
- Oral health awareness and maintenance training should become a part of mandatory training for caregivers and integrate oral care in the health care plan.
- The policy and guideline directs on the preventive dental interventions of adults with LD there still a gap evident in understanding and implication of the guidance in practice by the dental and care support team.

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