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A Systematic Review of Prevalence, Health Hazards, Risk Factors and Treatment of Pica Behaviour in individuals with Intellectual Disabilities

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ABSTRACT
People with intellectual impairments are typically affected by the disease known as pica. Picais the persistent consumption of non-food items, which can result in severe health-relatedcomplications. This systematic review examines the prevalence, risk factors, health hazards,and management of pica in individuals with intellectual disabilities. The review analyses datafromarangeofstudies,includingcasereports,cohortstudies,andclinicaltrials,toidentifythepopularity of pica and associated risk factors in individuals with intellectual disabilities.Additionally, the review explores the potential health hazards of pica, such as gastrointestinalobstructionandtoxiceffects,andexaminesdifferenttreatmentapproaches,includingbehavioural,pharmacological,andnutritionalinterventions.Thefindingsofthisreviewindicate that pica behaviour is common in individuals with intellectual disabilities and thatthereisaneedforeffectiveandindividualizedtreatmentapproachestomanagethischallengingbehaviour.

Keywords: Intellectual disability, PICA, Health Hazards, Treatment

I. INTRODUCTION

Intellectual disability or ID is defined as "a condition that starts before 22 years of age and ischaracterized by considerable limits in both intellectual functioning and adaptive behaviour"bytheAAIDD(AmericanAssociationonIntellectualandDevelopmentalDisabilities)."Intelligence," or intellectual functioning, is the general term for a person's capacity forlearning, reasoning, problem-solving, and other mental tasks.An IQ test is one tool forassessing intellectual functioning. An IQ score of 70 or higher (up to 75) suggests a seriousimpairment in intellectual functioning. People learn and employ a variety of social, cognitive,andpracticalskillsonadailybasis,whicharereferredtoasadaptivebehaviour.Languageandeducational attainment, concepts of money, time, and numbers, as well as self-control, are allexamples of conceptual abilities. Social skills include things like interpersonal abilities, civicengagement, self-worth, gullibility, naivete (i.e., wariness), social problem-solving, and thecapacity to abide by laws and standards in order to prevent being victimized [1]. Intellectualimpairments are characterized by challenges in conceptual, intellectual, social, and practicalfacets of daily life. In accordance with the DSM-5, these illnesses are neurodevelopmentaldiseases that start in childhood. Three requirements must be met for the DSM-5 to diagnoseID:1.Deficitsinsomeaspectsofintellectualfunctioning,suchas"reasoning,problem-solving,organizing,logicalthinking,decision-making,academiclearning,andlearningfromexperience,"asdeterminedbyclinicalexaminationandspecialIQtests".2.Deficitsinadaptiveabilitiesthatsignificantlyaffectaperson'sabilitytofulfiltheirsocialcommitmentsandfollowthe social, cultural, and developmental standards for independence and 3. These deficienciesbeganto appear in children [2].

Pica

Picaiscommonlycharacterizedasthecontinuousingestionofnon-nutritivefoodorsubstancesfor a month during a developmental stage that is improper for this behaviour [3]. The DSM-5(Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition) lists the following asthedefinitionofpica:1.Regularlyconsumingnon-food,non-nutritivesubstancesforaminimumofonemonth.2.Takingintoaccountaperson'sdevelopmentalstage,thesesubstancesshouldn'tbeingested.3.Eatingconductisnota practisethatissociallyorculturallyacceptable. 4. If the conduct coexists with another mental disease or medical condition (suchasschizophrenia,autismorpregnancy),itisseriousenoughtocallforindependenttherapeutictreatment [4]. The word "pica" comes from the Latin word,

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"magpie" a bird renowned for itshuge and unpredictable appetite [5]. Pica can appear in youngsters as early as 2 years old,teenagers, or adults. Pregnant women,[6] young children, and those who may have cognitivedisorders like autism are the groups who experience pica most frequently [7].
Approximatelyitoccursin75%ofinfants,15%oftwo-three-year-oldtoddlersand10-33%inkidswithmentalretardation that are institutionalized [8]. Pica has been connected to additional psychiatricillnesses. Risk factors for pica include stressors like psychological trauma, maternal scarcity,familyproblems,paternalnegligence,pregnancy,andanunorganisedfamilystructure[9][10]

TypesofPica

Thereiswidespreadconsensusintheliteratureonlabelinggiventothepicabehaviourmarkedas -phagias forthosesubstancesthathavebeenrecognisedasobjects ofpica[11].

1. The practice of consuming clay or soil, known as geophagia, is most prevalent inunderdevelopedcountrieslikeAfrica,amongAfricanAmericans,andamongpregnantwomeninthesouthernUnitedStates[12].Nevertheless,geophagiahasalsobeennotedintheIDcommunity.Peoplewithlearningdisabilitiesfrequentlyexperiencegeophagia,especiallywhentheyareinstitutionalizedforanextendedperiodoftime.Inthis context, geophagia and other types of pica are linked to a high incidence ofcomplications[13].
2. Pagophagia (eating ice) is a contradiction because, although being one of the most"normal"thingsnamed,itisoneoftheleastresearchedasadistinctbehaviour[14][15].Thereisalotofproofthatpagophagiaandanaemiaarelinkedinthegeneralcommunity[16].Althoughmostpatientsareignorantofthisandmaynotdiscloseittotheirdoctor,a persistent craving for ice may be an indication of an underlying condition that needsmedicalcare.Itcanbedifficultfordoctorstocontemplatepicawhenapatientpresentingpagophagiabecauseitisuncommoninprofessionalpractice.Withoutspecialisedattention,casescanbeconvenientlyoverlookedandincorrectlydiagnosed. Thus,doctors areadvisedtothinkaboutpicaanddeterminewhetherapatientiseatingtoomuch iceby asking specificquestions[17].
3. Geomelophagia(eatingrawpotatoes)isararekindoffoodpiracythathasbeenidentified,although itisnotfrequently done[18].
4. Since lead ingestion has long been known to be a major cause of lead poisoning,plumbophagia(leadeating)hasbeenacceptedastheframeworkdespitethefactthatthepathology of plumbismis rarely explored[19].
5. Less commonly is tricophagia (the ingestion of hair) noted in the texts. The discussionof pica, which is frequently caused by IDA and is frequently a cause of lead toxicity,was spurred bythediscovery ofahistory oftrichophagia[20].
6. FewcasesofCautopyreiophagia,oreatingcharred matchsticks,havebeendocumentedintheliteraturetodate.Onlytwoadultinstanceshavebeendocumentedsofar[21].
7. Lithophagia is the consumption of stones. In the context of autism, it is primarilydocumentedinthepaediatriccommunity.Accordingtotheresearch,therearenumerousproblemsthat frequentlycall foroperation,includingcolitis,intestinalobstruction,andvolvulus.Thisinstanceprovesthatcautious administrationispossible[22].
8. Coprophagia, or eating faeces, is a common occurrence in institutional environmentsamong people with intellectual disabilities and is linked to scatolia [23]. Some peoplewith developmental impairments experience coprophagia, which is linked to a numberof health hazards. (e.g., diarrhoea,intestinal parasites, blood-borne pathogens). Adearth of evidence-based evaluations (such as functional analysis) and inadequateexamplesofexperimentalcontrolhavelimitedstudiesthathaveassessedoperant-basedtreatments for coprophagia [24].
9. The practice of consuming the butts of cigarettes (tobaccophagia) is also frequentlydescribedinpeopleliving infacilitieswhohave intellectualdisabilities[25][26].
10. Acuphagia,oringestingsharpitems,isapotentiallyfatalhabitthathasbeenlinkedtoautism[27].Itcansometimesresultinemergencyconditionslikeintestinalobstruction, perforation, peritonitis, bleeding, acute weight loss, poisoning, and evenmortalityandcanbevery severeinsomeinstances[28].
11. Paperintakeisasymptomoftheeatingdiseasexylophagia.Thetypicalfoodsconsumedbythosewiththiseatingproblemincludepaper,pens,treebark,andotherwoodenobjects.Consumingpaperisthemostcommonformofxylophagia,buttherearealsoun

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commontypes ofpicathathavebeendocumentedintheliterature[29].

12. Metaleatingdisease,alsoknownasmetalophagia, israrelyreportedeventhoughitisconsidered one of the types of pica. There are not many. In actuality, there aren'tmany instances described in the relevant literature. Metal-eating disease has beendocumented in psychiatric patients despite being an uncommon condition in people[30].
13. Hyalophagia is the intake of glass products. Most foreign objects that are consumedinto the digestive system travel through the rectum asymptomatically, but objects thatarepointed,long,orjaggedmaynotbeabletodo so.Theseitemsmayresultinsurgeryinvestigation duetopotentialconsequenceslikeimpaction,whichcanresultinintestinalblockage, ulceration, perforation,and bleeding[31].

There have been other substances as well that are not labelled as -phagia but areidentified as pica objects if taken in quantities as great as 9 bunches of celery and 10litres of ice. And those include Ashes, Chalk, Cloth, Cigarette butts, Crayons, Cottonballs,Detergent,Metal, Paper,Plastic,Pencilerasers,Soap etc[11].

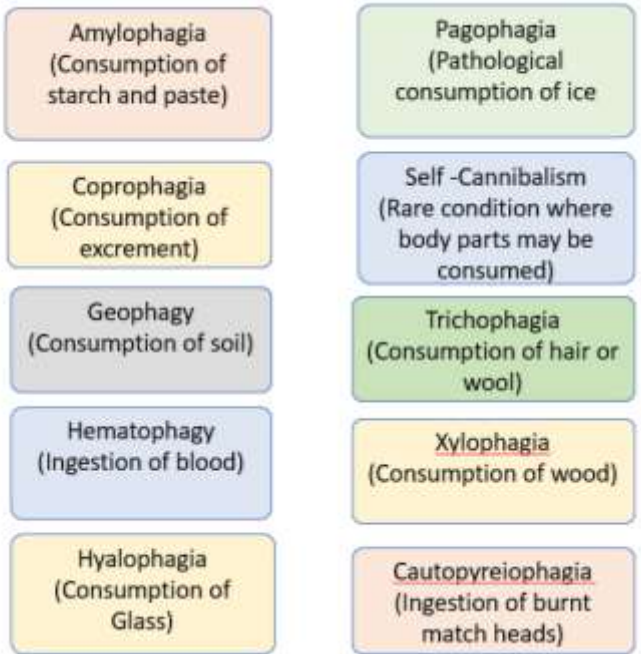

Fig 2: Types of PICA disorder

Prevalence

Picahasappearedinthreedistinctcontexts:in youthfultoddlers,insomesocietiesasasociallyacceptablebehavior,andidiosyncratically.Therearedocumentedidiosyncraticinstancesfrombothpeoplewithcerebraldisabilities and peoplewith averageability[32].

Up to18 months of age, pica—the practice of new-borns using their lips to examine objects—is accepted as typical activity. But there are dangers associated with infantile pica, and casesof parasite infections and lead poisoning have been observed [33]. In a study, 3,250 infantswereassessedbetweentheagesof10and36monthsoverthecourseofthreeyearsinaprivateclinicand 11.56% of thosefoundto havepica[34].

Additionally, pica has been connected to cultural and religious factors. The cultural theorynotes that in Africa eating earth was believed to suppress nausea in pregnancy and promoteswell-beingwhileMuslimsusetoconsumechalkdustoutofrespectforbrook.Clayeatingwasencouraged among the male youths of Greece [35]. Pregnant women are more prone toparticipate in this activity, while it can happen to people of all sexes, including both kids andgrownups.Reidrefersto1975researchinwhich56 womenfromacountyinMississippiwerequestioned.Tenpeopleregularlyused clay,whereas22occasionally didso[36].

Both intellectually disabled people and people of

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ordinary ability have been characterised ashavingidiosyncraticexamplesofpica.Picaisobserve dinavarietyofsituationsinindividualswith average intellect. The elderly with dementia, persons with eating problems, and adultswith mineral deficiencies are a few examples. It is the most frequent eating problem amonginstitutionalizedpeoplewith cerebraldisabilities[37].
Accordingtosomeinterestingtrends,thelikelihoodofh avingpicahasbeenshowntoriseafterthe age of 70, decline with age, and increase with the severity of an intellectual disability.[25][38]. Kinnell (1985) found that pica was more common in people with autism than inpeople with Down syndrome in a group of 70 mentally disabled people [27]. Danford andHuber (1982) also found a prevalence of 25.8% for overall pica, with rates of 5.4% for foodpica,16.7%fornon-foodpica,and3.7%formixedpica.Theydiscoveredthat thosewithseveredisabilitieshadahigherlikelihoodof mixedandnon-foodpica,whereaspeoplewithborderlineintellectuald isabilitieswereexperiencing food pica[25].
Adultswhoalsoexhibitchallengingconductaremoreli kelytohavepica,withprevalenceratesvaryingfromalo wof11.0%toahighof21.0%[39][40].Inagroupof940p eoplewithadualdiagnosis (i.e., ID and a mental illness co-existing), Dudley, Ahlgrim-Delzell, and Calhoun(1999) investigated the incidence rates of the psychiatric disorders and behavioural issues anddiscovered that 3.7% had pica. These figures need to be carefully evaluated because they arenot representative of ID in the general population because these studies estimated frequencybased on people who exhibited difficult habits or had a dual diagnosis, which can result inexaggeratedestimates[41]

PicaPrevalenceinIDindividuals:

Definitionofpica	**Method**	**Population**	**Prevalence**	**Study**
Repeatedingestionofnon-fooditemslackingnutritionalvalue	SEEDmethodology	n= 3161	31.6%	Fields et al.(2021)
Ingestionofnon-fooditems	inteRAIIDinstrument	n= 1008	21.8%	Ashworth etal.(2008)
Eatingobjectsnotconsideredtobefood	Questionnaire	n=311	2.9%	Hove(2004)
Thefrequentconsumptionofnon-food and food-relatedsubstances	Survey questionnaire distributedtostaff,residents	n=689	22.1%	Swift et al.(1999)
DSM-IVcriteria:theeatingofnon-nutritivesubstances	Directobservationandpsychological andfunctionalassessment	n=790	5.7%	Matson &Bamburg (1999)
Ingestionofnon-fooditemsandparticularfoodsubstances(ice coldfood,foodfrontrubbishbins, and discarded food)	Directobservationby nursing staff and review ofcase notes	n=246	10.2%	Tewarietal.(1995)
Mouthingand/oringestionofnon-nutritiveitems	Directobservationanduseofpicasurveyiver 1year	n=1010	16.7%	Witkowski(1990)

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Eatingnon-foodsubstances	Directobservationovera28day period; Semi-structuredinterview using theeating behaviour sectionof thePresentBehaviouralExamination-Mental Handicap	n=48	4.1%	O'Brien &Whitehouse(1990)
Theingestionof non-fooditems	Review ofmedical records;individual habilitation plans; andindividuals behaviour programs forbehaviours of pica	N=806	15.8%	Lofts,Schroeder,Maier(1990)

Implications of picaMedicalimplications

Pica can cause a variety of social and health issues that can have a minor to fatal impact onone'shealth.Malnutrition,toxicity,parasiticinfections,gastrointestinalblockagesandperforations, respiratory issues, tooth damage, mouth difficulties, and mortality are the tenhealthproblemscausedbypica.Isolation,stigma,andastrainonthesupportnetworkare examples of social repercussions. It's crucial to remember that most people who swallowforeign items are asymptomatic because the majority of them naturally move through thedigestivesystem [42][43].

1. Malnutrition

Pica may result from a deficiency in minerals like iron, zinc, or calcium. To come up with thenutrients in the body patients consume unusual items, like laundry starch, ice and soil clay.Both clay and starch can bind iron in the gastrointestinal tract, worsening the deficiency [44].Another view contends that pica directly prevents mineral absorption, whilst one hypothesisclaimspica isa response to mineral deficits.Zinc insufficiency, forexample, hasbeenconnectedtoIDandpicainpeoplewhoareinstitutionalised.[45][46],especiallyinthosewhopracticed geophagia[37].Thisresultsupportstheideathatsoiland claycanpreventorchelateiron and zinc uptake. In contrast,malnutrition may develop from pica when the personconsumes non-nutritive items instead of the regular diet, which reduces body weight andappetite[25].

2. Toxicity

Pica may cause exposure to harmful compounds like heavy metals, despite the fact that suchcasesareuncommon.Themostwell-knownoftheseisleadpoisoning,whichisbroughtonbyingesting paint chips, household dust, ink, lead objects, and lead-contaminated soil. Negativeeffectsofleadareseeninbothcognitiveandemotionaldevelopment.Asaresult,leadexposuremight worsen ID sufferers' behavioral issues and cause more brain damage. People sufferingfrom pica are still in danger even if governments have put policies in place to preventenvironmentalexposuretolead,suchas regulatinglevelsofleadinpaint[47][48][49]

3. Parasiticinfection

Pica also forms association with pathogens present in intestine, especially in coprophagic andgeophagic individuals [23][50]. For instance, Foxx and Martin discovered three people whohad intellectual disability (ID) and coprophagia, who also had whipworms; these people wereparasite-free once their pica level dropped as the outcome of behavioral intervention [50].Additionally, Danford& Huber discovered that

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institutionalized people both with pica and IDandhad pinworms substantiallymorefrequentlythan peoplewithoutpica[25].

4. Gastrointestinalinfection

Faecalimpactionanddigestiveconstipationh avealsobeenlistedassymptomsofpica[25][50].Additi onally,picaresultsinnausea,vomiting,fever,discomfo rt,anddistensionintheabdomen[42].GItractdisorders weremorecommoninthose withpica,accordingtoachartanalysisof64 residential adults with developmental impairments, and those with autism and pica had agreaterriskof GIdiseasesthanthosewithautismbutno picabehaviour [51].

5. Surgeryforobstructionsandperforations

Pica surgical complications are rare, but they can happen. Decker examined the medical filesof35HuroniaRegionalCentrepatientswithpicaan dIDwhohad56treatmentsforpica-relatedproblems between 1976 and 1991. He discovered that in 42 instances (or 75% of the cases),surgerywasnecessary,especiallylaparotomies toremoveforeignobjects[52].Similartothis,43docum entedcasesofsurgicalcomplicationsfrompicawereev aluatedinthe literature.Themostfrequentconsequencewasanintesti nalblockage,whichwasthenfollowedbyperforationw ithperitonitis(abdominallininginflammation)andhar denedabdominalmasses.(i.e.,bezoars) [53].
Certain substances are riskier than others. Compared to smooth things like pennies or plasticbeads, sharp and big objects tend to cause more tissue injury and necessitate surgery [42]. Forinstance, according to one research, vinyl gloves used for personal hygiene are challenging toremove after ingestion because they harden and occasionally form sharp bezoars (some kindofforeignobjectthatcannottransitthroughtheinte stines).Obstruction,perforation,inflammation,andul cerationinthegastrointestinalsystemwithbleedingare possibleconsequences asaresult[54].

6. Respiratoryconditions

Foreignobjectstrappedintheesophaguscanc ausechoking,breathingproblems,breathlessness, and wheezing. Undiscovered foreign objects in the oesophagus could causerecurrent asthma. In addition to causing neck swelling, esophageal foreign bodies can harmandperforatetheesophagus[42].

7. DentalDamage

In several case studies, pica is connected to tooth surface loss. In particular, prolonged picawithhard materials,such as stones, metals,or ice,may causetoothharm.[55]

8. Oralcomplications

Some people with pica like to consume cigarette butts. Because of this, those who consumecigarette butts on a regular basis face the danger of acquiring oral cancer, periodontal disease,andgingivalrecession.[25][26][56][57]

9. Death

Pica sufferers, especially those with serious and ongoing pica, run the danger of suffocationand intestinal blockage leading to death. Three fatalities (3.2%) had connections to pica inresearchthatlookedatthecausesofmortalityamong9 4patientsinahospitalfordevelopmentally delayed kids [58]. According to a report, 4 (11%) of the 35 pica afflictedpeoplewhowerehospitalizedwithinahospital overa15-yearperioddiedfromcomplicationsassociated with their condition. The significant mortality risk linked to pica is noted in manycasereports[52][59].

Social implications

The societal effects of pica have been the subject of a very scant amount of study. As aconsequenceofheightenedstigmafromothers,people withpicamayexperiencegreatersocialisolation [23][60]. Staff members are more likely to avoid and exclude people who havecoprophagia(eatingfaeces)fromevents.Thisisbe causetheyareworriedaboutcross-contamination [32][23]. The individuals may be prevented from engaging in worthwhileactivities by pica and its related behaviors, or they may be prevented from doing so by thesafetygeartheyarewearing[61][62].Peoplewhoha vepicamayalsogoonfewercommunityexcursionsand/ ormaynotbeallowedtogoanywherewheretherearepos sibletriggersfor theirpicabehaviour.Theresponsibilitiesofprovidingf orapersonwithpicamayalsohaveanimpactontheinfor malsupportsystem,leadingtomorecontentiousrelatio nshipsanddecreasedsocialinteraction with relatives for peoplewith pica.

PicaRiskFactors

Even though the precise cause of pica is unclear, most studies believe that there are

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severalcontributing factors [63]. Age, gender, mineral deficiency, genetic disorders linked to ID,mentalillnesses,andsocialenvironmentarethemostfrequentriskfactorsassociatedwithpica,allofwhichenhancethepossibilitythatpeoplewithID mayparticipateinpica.

1. Age

While some investigations have discovered that pica tends to occur in older [64] or that thenumberofpicacasesincreasesafter70yearsofage[25],othersreportnoassociationwithage[26][46][65], pica rates are typically greater in younger ID patients than elderly patients [25][38][57]. According to some experts, pica continues throughout life because it is frequentlymisdiagnosed,underreported,andneglectedbecauseitisnotperceivedasbeingasdetrimentalas other difficultbehaviors, likeaggression[25].

When analyzing the correlation between age and pica, it is crucial to take into account thatindividuals with ID are aging just like the normal population is. Some hypothesized that pastresearch may have observed a lower level of pica prevalence in later ages simply because theID community as a whole had a younger age structure [66]. This is usually true of individualswith profound and severe levels of ID who reside in institutions and are at a higher risk ofpassingaway than theirpeerswith higher functioning[67].

2. Gender

Malesarediagnosedwithpicamorefrequentlythanfemales;theratioofmaletofemalerangesfrom1.3:1to2:1[26][38][45][46][57]Swiftdiscoveredthatinacasecontrolstudygenderwasnotsubstantially connected to pica.

3. LevelofID orSeverity

The most compelling results in the pica literature is the tendency for people with deep andssevere levels of ID to display pica more frequently than people with moderate levels of ID[25][26][38][41][45][46][57]. Particularly, the occurence of pica is inversely correlated withthe level of ID (as established by IQ), so that pica incidence rises with greater ID severity orlower IQ scores. The research has provided large number of theories for this relationship,ranging from developmental mouthing difficultiesassociatedto the ID itself, to sensorystimulation, to those with significant cognitive disability being unable to distinguish betweeninedibleandedibleobjects.AccordingtoHove(2004),picamightindicateIDpopulation'slackofself-careandeating adaptationskills[65].

4. MineralDeficiencies

Pica has also been associated to mineral deficiencies, particularly in those who are part of thenormal population, including those in iron, zinc, copper, and magnesium. It is believed thatindividualswhohavelowamountsofcertainmineralsintheirbodieshaveaninnatebehavioral reactionorurgetoseekoutcertainmineralsfromunexpectedsources,includinginediblethings[32]. However, pica frequently occurs even when there are no mineral deficiencies [38], andthe majority of research demonstrate that people with ID and pica consume foods that areextremelydeficientin minerals.

Amongthefirsttolookintothedietaryexplanationinindividualswith IDofpicawasDanfordet al. (1982). They observed that plasma zinc and iron levels were considerably lower in thosewho have pica, whereas magnesium and copper levels were not statistically different betweenthetwogroups,whencomparing60individuals withpicato6individuals withoutpica[25].

Similar to this, a study by Lofts et al. (1990) found that 54% people with pica (n=69) had lowbloodzinclevels(zinclevelslessthan0.90ug/dl),as opposedto7%of14peopleinthecontrolgroup.Additionally,theydiscoveredthatpeoplewithID,pica,andlowserumzinclevelscouldbenefit from zinc supplementation through 100 milligrams of chelated zinc. This reduced thefrequencyofpicaincidentsfrom23perpersonto4.3perpersonwithinthespaceoftwoweeks,butitdid notcompletely eliminatetheir pica[45].

Swiftetal.(1999)expandedontheoutcomesofthefirsttwoinvestigationsandcreatedamongthe most meticulously planned case-control studies in this area. They specifically contrasted152 patients with ID plus pica to 152 controls who had ID only in their blood samples. Aftercorrectingfortheperson'slevelofID,theydiscoveredthatindividualswithlowbloodzincandiron levels had 5.43 times and 6.25 times, respectively, the probabilities of developing pica.This is the first study to demonstrate that mineral status, while accounting for an individual'sdegreeof ID, isaseparaterisk factor for pica[46].

To acquire more accurate estimations of the connection between mineral deficiency and pica,future research will be required to build on this model and incorporate all known risk

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factorsforthecondition.

Intellectualdisability

Autism

According to estimates, 30.0% of people with ID have autism as a point prevalence [68]. Picais typical in autistic individuals [26][27][41][58][65][69], and others. In fact, a study by Hove(2004)indicatedthatindividualswithautismwer emuchmoreprobablethanpeoplewithothereatingdiso rderstohavepica[65],whileadifferentstudyfoundthati ndividualswithpicahaveconsiderablymorelikelihood ofhavingautism[41]).Thisresultisnotunexpectedcon sideringthat severe to profound levels of ID, a review found that an average of 55.5% of individualswithautismhavearecognised susceptibilityfor pica[70].

In an observational research, Kinnell compared 70 people who had autism to 70 people withDown's syndrome in relation to pica behaviour and discovered that people with autism (60%)were more likely than people with Down's syndrome (4% to practise pica) [27]. Just 4% ofpeople with pica and Down's syndrome also had autism or schizophrenia concurrently. Picamaybesyndrome-specific,buttheoverallleveloftheisrelationshiphasnoty etbeendemonstrated [46]. Fields et al. evaluated pica in kids between the ages of 30 and 68 monthsbothwithandwithoutASD(median=55.4mont hs).ChildrenwithASD(23.2%)andDDhadhigherrates ofpica(8.4%),aswellasinthefollowingsubgroups:AS DwithID(28.1%),ASDwithoutID (14.0%),DD withID (9.7%), DD withASD characteristics (12.0%),andDD with bothIDandASDcharacteristics(26.3%).Incontrast,ch ildrenwithDDwhodidnothaveIDorASDtraitsdid nothaveagreater incidenceofpica.[71]

Psychiatric or mental disabilityOCD

According to some, pica is considered among the obsessive-compulsive spectrum disorders,wheretheconsumptionofunusualsubstance sresultsinadepletioninanxietyortensioninthenormalp opulation[72][73].InpeoplewithIDwhodisplayextre meorpersistentpica,theorizethat pica can be productively understood as obsessive behavior; however, no formal researchhastested thisassociation [74].

Upadhyayaetal.describeaninstanceofanilliteratetriba lwomanwhoexperiencedpicaastheonly symptom of obsessive-compulsive disorder that started while she was pregnant. Thepatient was compelled to consume raw rice or wheat, which gave her toothaches and stomachpain. In three successive pregnancies, she had this behaviour. It spontaneously resolved afterpuerperium in the first two pregnancies but remained in the final one. Thus, coming to theconclusion that pica might either merely be a symptom of obsessive-compulsive disorderduringpregnancy oritcould beanOCDspectrumcondition.[75]

In the other case report a 16-year-old kid with a history of melancholy and anxiety as well as10priordeliberateforeignbodyingestionsinvolving sharpitemsincludingneedles,forks,andthumbtacks, is the subject of this case. He admits to eating a nail lately and dismisses anycurrentobsessions.Hewastransferredfromanearb yinvoluntaryreceivinginstitutionbecausehis recent bowel motions had reduced. There are suggestions for practitioners as well astakeaways to consider. This example provides evidence in favour of the literature's contentionthatpicafallswithintherangeof OCD-relatedillnesses [76].

Schizophrenia

Pica behaviours are prevalent in the setting of schizophrenia, as demonstrated by Osuji andOnu's assessment of 206 incident cases of schizophrenia, which revealed a high proportion oftheseincompatiblebehaviours(14.3%)intheearlyst agesoftheillness[77].Giventhepaucityof research in the field, some potential causes of pica behaviours in schizophrenia include: (1)Psychotropic-inducedcompulsiveeatingbehaviourofinediblemater ials,suchasacasereportof pica behaviours following continuous, chronic olanzapine treatment, which was attributedto cortico-basal ganglia dysfunction via blocking 5-HT2a receptors and increasing dopaminereleaseinthemidbrainandfrontalcortex;(2) Prolongedmalnutritionormicronutrientdeficiencies syndrome brought on by long-term schizophrenia symptoms; (3) Comorbiditybetweenschizophreniaandobsessive-compulsivedisorder;(4)Hematopoieticinhibitionbro ught on by long-term schizophrenia or long-term psychoactive drug use; (5) Hyperoralityin the context of cognitive deficits and temporal lesions; (6) As a symptom of disorganisationoverthecourseof schizophrenia;(7) Secondary todelusionalbehaviour[78].

A case report describes a case of 34-year-old male with decompensated schizophrenia. Hisactive psychosis, which included delusions, jumbled mental processes, and weakening ofconnections,wasshowntobethecauseofhispica [79].Asanalternative,ithasbeenassertedthat

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frontotemporal dementia in young adults may be mistakenly classified as schizophreniabecausethecondition'searlysymptoms aremoreakintothatillnessbeforeprogressingto dementia symptoms in its later stages [80]. Pica may, to a lesser extent, be connected todelusionsorparanoidthinking,accordingtotheliterature[59]).Withtheexceptionofthetwocasestudiespublished,littleisknownabouttheconnectionbetweenschizophreniaandpicainthe ID population. They described two cases of people who were diagnosed with ID andschizophreniaearlyinchildhoodandlateracquired pica.(i.e., age40and76)[59]. Thesefindingsgoagainstthetypicalobservationthatpicaismoreprevalentinyoungerpeople.

Dementia

Although the prevalenceis unknown, several studies have shown that older adults withdementia exhibit abnormal eating patterns, including pica behaviour [81][82][83][84]. Forinstance, Morris et al. (1989) discovered that among 33 dementia sufferers, 15% attempted toconsumeinediblesubstances(suchasfaeces,soap,or flowers)and15%consumedinappropriate substances. (i.e., uncooked food, pet food). They proposed that eating inedibleobjectsmightbeexplainedbyaninabilitytorecogniseobjects(agnosia)oralossofthedisgustmechanism [84]. According to Hope et al.'s study, 22% of 85 dementia patients reportedchewing or swallowing non-food items [81]. Ikeda et al. (2002), on the other hand, comparedtheeatinghabitsofpeoplewiththreedifferent subtypesofdementia:frontalvariantfrontotemporal dementia (fv-FTD) (n = 23), semantic dementia (n = 25), and Alzheimer'sdisease (n = 43). While semantic dementia only refers to the atrophy of the temporal lobes,frontotemporal dementia refers to the progressive focal atrophy of the frontal and anteriortemporallobes(Ikedaetal.,2002).Incomparison,dementiaoftheAlzheimer'svarietyexhibitsapatternofbrainatrophythatismoreevenlydispersedandencompassesatrophyofthefrontal,temporal,and parietalareas[82]. Collectively,thesestudiesindicatethatpicaislinkedtodementia,andmoreresearchisneededto confirm Ikeda's finding that pica is more common in people with semantic/temporal lobedementia. Dementia and pica in people with ID have not yet been the subject of any researchthat are currently available. Given that people with Down's syndrome have a higher chance ofdeveloping Alzheimer's disease than the general population and may exhibit higher rates ofpica,thismay beacrucialfieldof study tolookinto.

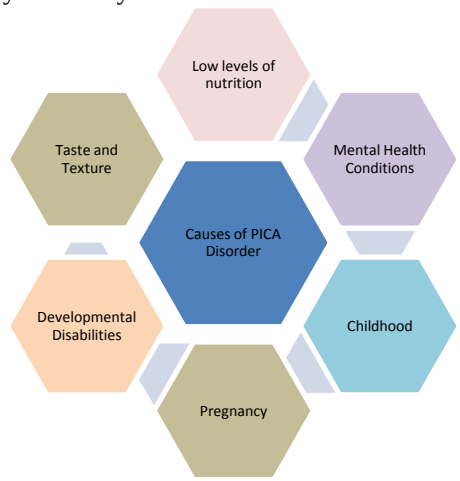

Fig. 1. Causes of PICA Disorder

Treatment

The medicinal, dietary, and behavioral therapies used to treat pica in people with ID arereviewed in this section. Burke and Smith (1999) have issued a warning that the majority ofconclusionsaredrawnfromstudieswithsmallsample numbers(casestudies),brieftimespans,andbaiting(itemsareplacedintheenvironmentaspicatargets)[85].Furthermore,sincemostinterventiontrialshavebeendoneonchildren,itisunclearhowwelltherapieswork foradultswithID.Futurestudiesmustconcentrateonadultpatientswith IDandpicawhoneedtherapies.

1. Medications

Medications,particularlypsychotropicsand anticonvulsantshavebeenfoundtobesignificantlyasso

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ciatedwithpersonswithIDandpica[25][52][86].Neuroleptic medication,itis argued, may have a direct link with pica, due to "anti-dopaminergic effects" which mayworsen pica behaviour [87]. On the other hand, the higher rate of neuroleptic medication mayreflectthetreatmentofchoiceforpica.Theseassociations,however,arelikelytobeconfoundedbyindication.Thatis,individualswithhigherlevelsofcognitiveimpairmentmaybe more likely to be prescribed these agents for other reasons besides pica (e.g., behaviouraldisturbance, epilepsy), whereas less severely cognitively impaired individuals would not usethese. Therefore, the relationship between psychotropic and anticonvulsant medications andpica are questionable and requires a more appropriate study design to fully assess the reasonsfor using particular drugs among individuals with ID and pica.The use of medications to treatpica has not been adequately studied in the literature. Two adults and one adolescent withnormal intellect have pica, and treatment with selective serotonin re-uptake inhibitors (SSRIs)has been provento lessen the severityof the pica.The antipsychotic drugthioridazine,however, was found to have no effect on the reduction of pica in three adolescents withprofound ID[88].

Comparing the placebo and antipsychotic medication periods, these patients had decreasedrates of pica. As opposed to the placebo phase, the injection of a stimulant (methylphenidate)reducedthrateof picain thesepeople[87].

2. Nutritional

Severalstudieshaveshownthatdietarysupplementslessenthefrequencyofpica[45][89][90].69personswithIDwhowerelivinginaninstitutionandsufferingfromzincshortagereceived100mg of chelatedzincwhich worked forthem [45].

The average number of pica incidents per person decreased from 23 episodes to 4.3 incidentsafter taking the nutritional zinc supplement. Using an A-B-A design, Bugle and Rubin (1993)demonstratedthatVivonex,anutritionalsupplement,decreasedtheoccurrenceofcoprophagiain two adults and one child with ID compared to their regular diet, although it did notcompletelyeradicateit.AchildwithIDandpicahadsimilaroutcomestothosefoundbyPaceandToyer (2000)[89][90].

3. Behaviouraltherapies

Theresearchthatisnow accessibleoffersavarietyofbehavioraltherapiesforthetreatmentofpica,albeitthemostsuccessfulmethodshavenotyetbeenfound.Environmental,sensory,anddiscriminationtrainingaretheleastintrusiveinterventions, whileresponseblocking,overcorrection,aversivesubstances,negativepractice,self-protectiontools,andphysicalrestraintarethemostintrusiveinterventions.

The current study discusses the behavioural management of pica in a female 3-year-old withusual development. A multiple baseline across settings single-case experimental design wasused to showthe effects of differential reinforcement,extinction,anda token economytreatment package to reduce rates of pica after a pre-treatment functional assessment showedthatpicawas maintainedbycarerattentionInallconditions,thereweredecreasesinpica.Picarates remained low as a result of the final treatment plan's integrity-driven implementation bycarers. This case study showed that when medical measures are unsuccessful, behaviouraltherapies can reducepicain childrenwho areusuallydeveloping [91].

4. Environmental InterventionsPhysicalsetting

Tohelplimittheamountoftimethepersonmustbewatchedoverorrestrained,environmentalcontrols that are frequently employed to reduce pica behavior include removing and lockingupobjects fromtheareathatcouldbeconsumedbytheindividual(i.e.,"picaproofing")[92].

Societalsetting

Some discovered that individuals with ID tended to participate in pica when they were bythemselves or unoccupied and that the frequency of pica could be decreased by adding toys totheir environment [93]. Aa research showed that a 10-year-old autistic child's pica behaviorwas reduced when she had access to a "pica box" comprising safe edible and inedible objects[94].

5. OralStimulation

Thisapproachisfoundedontheideathatautomaticreinforcementmaintainspicaandthatsaferalternatives to oral stimulation (such as toys, food, drinks, and gum) are offered to competewiththeindividual'spica.Forinstance,bytying threadstohistoys, Piazza,Hanley,Blakeley-Smith, and Kinsman (2000) taught a blind toddler to discover substitute mouthing toys toreplace his pica

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behavior. A more focused strategy is to give the person stimuli that closelyresemblethesensorycharacteristics oftheinedibleobjects theywanttoconsume[49].
In one adolescent and one kid with ID who showed a propensity to consume firm non-edibleitems, the supply of firm-textured meals (e.g., carrot sticks, rice cakes) was more effective inreducingpicaratesthan soft textured foods(e.g.,gelatin)[95].
Ontheotherhand,additionalstudyisrequiredtodetermi nehoworalstimulationaffectsadultswithID.

6. ResponseBlocking

Response blocking tactics, such as the use of verbal cues, physical assistance, or physicalremoval, stop or prevent the person from engaging in pica. Response blocking alone was lesssuccessful than response blocking combined with redirection to alternate food options atreducingpicaand hostility in anadultwith ID[96].

7. Discriminationtraining

ManyclaimthatpicabehaviourinpeoplewithI Discausedbyalackofdiscriminationbetweenediblean dinedibleitems[48][97])thoughitisunlikelythatteachi ngpeopletodiscriminateonits own will successfully treat pica over time because people with pica often have cognitiveimpairments.[60].

8. Overcorrection

Overcorrectionisthetermforattitudemodific ationthroughexcessivepractiseandinstruction[98].
When used alone or in combination after a person exhibits pica behavior, oral hygienepractises like cleaning teeth, washing hands and faces, and tidying have been shown to lowerpicaratesin adultsand teens with ID[23][99].

9. Aversivesubstances

Whenusedasaformofdiscipline,aversiveliq uidslikewatermist,lemonjuice,andammoniaareeither squirtedintheperson'sfaceorlipsorinhaledbythem(int hecaseofammonia)[100].
In an autistic teenager, Rojahn et al. (1980) found that water mist was more successful atreducingpicathan ammonia[62].

10. Negativepractice

Aversivepractiseslikenegativepractisearefo undedontheideathatrepeatingabehaviourwillultimat ely make it unpleasant for the person doing it. For instance, Duker and Nielen (1993)used a negative practise in which the staff would press the adult with ID's palm holding thenon-edible object to her lips and prevent her from biting on it for two minutes after eachinstance of pica. After numerous iterations of this harmful practise process, the person's picarates weredecreased butnotentirelyeradicated[101]

11. Self-protectiondevices

Self-protective tools that stop the person from engaging in pica are used when pica is severeand life-threatening or dangerous objects (such as nails or glass) are sought [98]. These toolsinclude mechanical restraints, such as mesh bags or hoods, jackets that restrain the person'sarms and hands, and fencing masks or helmets with a face shield that prevent access to theperson's mouth. When an adolescent with ID and pica used a time-out helmet for 15 minuteseach time he participated in it, along with food incentives when his pica did not appear,Ausman,Ball,andAlexander(1974)foundade creaseinpicabehaviour[102].Similarresultswere found by Rojahn, Schroeder, and Mulick (1980), who discovered that three adults withID's pica was diminished when they wore camisoles and fencing masks for two hours eachworkday, despite their lowered work and social contacts [62]. Using the example of a childwho was able to consume pieces of the restraint system, Le Blanc, Piazza, and Krug (1997)argue that picacouldbedecreasedjust aseffectively withoutthe useof self-protectiveapparatus[61].

12. PhysicalRestraints

Physical restraint methods are used to limit the person's chances to participate in pica, muchlike self-protective devices. According to studies, adults and teenagers who experience picamaybenefitfromshort-termphysicalrestrictionintheformofholdingtheirarm sattheirsidesfor10 seconds[99][103].

II. CONCLUSION

Based on the systematic review conducted, it can be concluded that pica behavior is prevalentamongindividualswithintellectualdisabiliti es.Thereviewfoundthatseveralriskfactors,suchasage ,sex,andseverityofthedisability,areassociatedwithpi cabehavior.Thehealthhazardsassociatedwithpicabeh aviorarenumerous,includinggastrointestinalobstruct ion,malnutrition,and poisoning.

The review also highlighted the importance of identifyingand treatingpica behavior

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inindividualswithintellectualdisabilities.Thetreatmentoptionsincludebehavioralinterventions, medication, and dietary modifications. However, more research is needed todeterminetheeffectivenessof theseinterventions.

Overall,thereviewunderscorestheneedforhealthcareprovidersandcaregiversto37beawareofpica behaviorinindividualswithintellectualdisabilitiesandtotakeappropriatemeasurestoaddress itto preventnegativehealthconsequences.

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