ijlpr 2023; doi 10.22376/ijlpr.2023.13.5.L90-L97

International Journal of Life science and Pharma Research

ISSN 2250-0480

Gadget Addiction in Children and Its Management Through Ayurveda: A Review Article

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Abstract: Gadget addiction in children is a new problem arising all over the world and this addiction affects the growth and development of children with a greater impact on their social behavior. Addiction is a social stigma in society. Any addiction is a result of attraction toward the bad thing. In Ayurveda, literature acharyas describe various methods to control the mind's desires and restrain bad habits. Our aim in this study is to review the literature on Ayurveda methods that could be beneficial in the management of gadget addiction. In Ayurveda literature, *PadanshikaKrarma, AcharaRasayana, SatvavajayaChikitsa, and Yoga* have been proven actions to control the mind. A benefit of applying this methodology is that they are cost-effective, requires minimal infrastructure, and requires minimal persons for this therapy. Yogchikitsa has been traditionally practiced for centuries in India; hence, people easily accept it.Along with de-addiction, it improves the general well-being of a person. *PadanshikaKrama, AcharaRasayana, and SatvavajayaChikitsa*are the methods to change the patient's thinking and divert his mind from unwholesome things to wholesome things. Though Gadgets are helpful in day-to-day life, their excessive use harms mental, physical, and social life, academic goals, and career. Children are future adults; hence, it is necessary to de-addict them as early as possible. Therefore, building a generation that can opt for a healthy lifestyle over any addiction is necessary. It could be possible by using a good code of conduct as per *Ayurveda* and *Satvavajayachikitsa*, restraining the mind from unwholesome objects. Previous studies were conducted in developed countries and in urban areas of India where all the facilities are available but expensive. Hence in developing countries, *Yoga* is more convenient because *Yoga* is traditionally practiced in India and people are aware of its benefits and the method of conducting Yoga. Hence it will be easier to train Children and their parents regarding Non-pharmacological interventions suggested in *Sattvavajay*, which is almost free of cost; hence anyone can afford it without any hesitation.

Keywords: *Ayurveda*, *Acharya Rasayana*, Gadget Addiction, *Kaumarbhritya, Satvavajaya, Yoga*

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Received On 17 January, 2023

Revised On 10 April, 2023

Accepted On 17 April, 2023

Published On 1 September, 2023

Funding This research did not receive any specific grant from any funding agencies in the public, commercial or not for profit sectors.

Citation Dr Prasad Yewale ,Dr.Renu Rathi and Dr Swapnali Mate , Gadget Addiction in Children and Its Management Through Ayurveda:A Review Article.(2023).Int. J. Life Sci. Pharma Res.13(5), L90-L97 http://dx.doi.org/10.22376/ijlpr.2023.13.5.L90-L97

1. INTRODUCTION

Ayurveda is not only a science of health but it is the science of living; it is not only limited to the diagnostic method, treatment and management but also describes the method of prevention as well as rules to follow to live a good social life. Ayurveda points towards omitting bad habits and accepting the good habits of human beings. Though the definition and concept of that bad habit may change with time, the method to omit and prevent that bad habit is proven helpful in this era. Change as per time is a rule of this universe hence everything changes according to time; as technology develops very fast, the concept of entertainment is also changed. The Internet brings a revolution in human life as well as in the field of entertainment. Most people spend time and find joy on the Internet through Gadgets. Previously there was a curiosity about these Gadgets and people and children were attracted to them but silently it addicted many people. Addiction has been an issue of social and cultural concern since the ancient era. Addiction may be defined as a process whereby a behavior that can produce pleasure and relieve internal discomfort is employed in a pattern characterized by a recurrent failure to control the behavior(powerlessness) and continuation of the behavior despite significant negative consequences (unmanageability)[1]. Gadget addiction is a broad term covering the addiction to Video games, Gambling, Pornography, and Social media through TV, Smartphone, Computers, etc. Gadget addiction is classified as a type of behavioral addiction, these addictions are like drug addiction, but in these addictions, a person is addicted to feeling brought about by using a Gadget and not the substance [2]. The mesolimbic brain circuit plays a vital role in behavior due to addiction[3]. All addictive substances increase the feeling of pleasure, leading to repeated use. Many studies reveal that addictive substances or habits activate dopamine-secreting neurons directly or indirectly. Gadget addiction hampers children's physical and mental health. Eye irritation, headache, backache, and finger pain are common with Gadget addiction, but few cases reported obesity due to reduced physical activity in these children. Social isolation[4], impaired social skills[5], Poor academic performance[6], Attention deficit hyperactivity disorder[7], Depression, and suicidal ideation[8] have been reported to be associated with alcohol abuse[9] and Sleep deprivation[10]. Many video games increase aggressiveness in children; many adult contents are not suitable for children and are responsible for sexual assault these things are harmful to a healthy society. In addition, there is a problem with choosing the right things over the wrong ones; it is related to the person's decision-making. Though Ayurveda literature has no direct reference to addiction, the terminology *of Asatmeindriyartha Samyoga*[11] and *Pradnyaparadh*[12] is much equivalent to today's Gadget addiction.This Gadget addiction affects children worldwide, irrespective of socioeconomic status. Where there is the availability of the Internet, there are Gadget-addicted children. Many Researchers are trying to find a solution to it and discover pharmacological and non-pharmacological methods to treat Gadget addiction. Non-Pharmacological intervention includes Cognitive behavioral therapy as a rational treatment for Gadget addiction. Though it is effective in managing Gadget addiction, it is time-consuming and requires a trained pediatric psychologist and a good infrastructure. Underdeveloped and developing countries lack these facilities and, if available, are not economical for every person; hence it is necessary to search for an alternative therapy that will be convenient for each person. So this review study aims to enlighten the non-pharmacological and cost-effective interventions to de-addict children. This study aims to assess the effectiveness of non-pharmacological treatments like *Yoga Chikitsaand Satvavajaya* for Gadget addiction using all available relevant research from *Ayurveda Samhita*, contemporary science, and publications.

2. MATERIALS AND METHODS

The information is collected from various *AyurvedicSamhitas*, textbooks on *yoga*, Pediatrics, articles and published research papers, journals, medical websites, etc.

2.1. Review on Gadget Addiction

2.1.1. DoshaDushya's Involvement in Gadget Addiction

- **Hetu**

1) *AsatmeindriyarthaSamyoga*

It means indulgence in unhealthy subjects of sensory organs. The constant use of Gadgets causes, sensory overload, energizing the mind for subjective experience and the tendency of these experiences to cause ill effects. According to the *Bhagavad Gita*, pleasure from these sensual indulgences develop an attachment that ignites the desire to have more. When not fulfilled, it leads to anger, and from anger comes delusions followed by loss of memory and, from loss of memory, destruction of intellect, leading to a disturbed mind which loses control over choosing the right things.

2)*Pradnyaparadh*

The word *Pradnyaparadha* is made of two words *Pradnya +Aparadh; Pradnya* means *Dhee*(intellect) + *Dhruti*(control)+ *Smriti*(memory), *and Aparadh* means misdemeanor. So *Pradnyaparadha* results due to deranged intellect, control, and memory. In addition, (could be of any type), the mental ability of the addict is compromised consequently decision-making regarding good or bad is also hampered.

2.2. Dosha involvement

2.2.1. ManasDosha

Clinical features of Gadget addiction are related to *Raj Guna*, and *TamoGuna* is predominance features [13].

2.2.2. Dehadosha

***Vata*:** Controlling the mind is the function of *Vata Dosha*[14]; in Gadget addiction, the restraining power of the mind is delayed.

Pitta: Intellect is delayed in Gadget addiction related to *Sadhaka Pitta*[15].

Dushya: *Buddhi* **-** A person's intellect, restraint, and memory are affected, which are the function of *Buddhi.* From the above clinical feature, we could conclude that *Buddhi* is the main *dushya* in Gadget addiction. Adhishthan – *Manas*(Mind)

2.3. Mind-Body and brain function affected by Gadget

It has been discovered that Gadget addiction has negative structural and physiological consequences on the mind, brain,

and body. Neuroimaging studies have shown that Gadget addiction is linked to structural and functional alterations in brain areas involved in executive attention, decision-making, emotional processing, and cognitive control.[16] According to studies, Gadget addiction is directly connected with impulsivity, and impulsivity is positively correlated with reduced prefrontal cortex grey matter volume.[17] Several morphometric investigations on cortical brain centers with Gadget addiction have recently discovered plausible neurological pathways. Executive control brain areas, such as the orbitofrontal cortex, dorsolateral prefrontal cortex (dlPFC), and anterior cingulate cortex (ACC), revealed decreased grey matter volume.[18-21] Humans are wired psychologically, so inhibitory control affects one's action depending on whether it is right or wrong. In the event of addiction, the inhibitory center takes a back seat, and the activity is noticed. It implies a problem with the brain's inhibitory regulation, which is supported by studies demonstrating the decreased activity of the right anterior cingulate cortex in Gadget addicts' brains and reduced grey matter volume in the insula, temporal cortex, and left orbitofrontal cortex.[22] It has also been established that white matter integrity is compromised in the Gadget-addicted brain, which disrupts appropriate connection and processing between the two hemispheres and connections between different brain lobes.[23] Dopamine transporter is a protein found in presynaptic terminals responsible for active reuptake into presynaptic neurons, thereby playing an important role in controlling striatal synaptic dopamine levels. [24] Further neuroimaging data reveal that Gadget addiction is connected with dopaminergic brain system dysfunctions and dopaminergic neural system abnormalities are similar in persons with substance-related addiction[25].Particle emission tomography studies revealed a clear involvement of dopamine in reward and addiction.[26] These studies also indicated that addiction influences motivation and organizational processes in the brain. An extensive but meticulous neuronal circuitry connects different executive and reward centers of the brain in the motivation-guided brain. The medial prefrontal cortex receives conceptualized neural input via sensory organs. Following cortical processing, an electrochemical signal is sent to a network of highly interconnected neuronal areas, including the left frontal lobe, dlPFC, lateral orbitofrontal cortex, and insular cortex, which are the brain's executive centers responsible for goal-directed decision-making.[27] For decision-oriented movement, executive components of the brain send signals to the striatum and motor cortex. Furthermore, these centers are linked to the hippocampus and amygdala for memory consolidation. Furthermore, the medial prefrontal cortex is linked to reward centers, the ventral tegmental area, and the nucleus accumbens (NAc).Internet gaming is associated with dopamine release comparable to that of drugs of abuse, as well as lower dopamine transporter and dopamine D2 receptor occupancy, indicating dopamine reward mechanism subsensitivity.[28] Dopamine influences motivation by regulating target regions such as the NAc, Acc, orbitofrontal cortex, dlPFC, amygdala, dorsal striatum, and ventral pallidum.[29] According to Volkow et al., models in addiction-dominated reward circuitry, the ventral tegmental area, NAc, hippocampus, and amygdala are significantly engaged. At the same time, executive components such as the prefrontal cortex and Acc are less relevant. When the amygdala is activated, it stimulates the hypothalamic-pituitary-adrenal (HPA) axis, which raises adrenaline and cortisol levels in the blood and causes stress. However, a well-organized executive neuronal circuitry is required for proper goal-oriented brain functioning, distorted in any addiction, including Gadget addiction.[30] Research demonstrates that Gadget addiction has a detrimental impact on cognitive function.[31] Media addiction and "self-reported impulsivity" have a positive association.[32] Gadget addiction hampers the academic performance of students. Anxiety, despair, lower Happiness Scale, and mental well-being scores were all linked to Gadget addiction.[33] Serious postural problems[34] along with neck, back, and wrists pain arise due to prolonged use of the Gadget.[35]

2.4. Management of Gadget Addiction

Scientists discover various methods to de-addict a person from Gadget addiction. Many of them are found useful.

2.5. Modern Non-Pharmacological treatment

2.5.1. Cognitive Behavioral Therapy

It is the most popular and proven method in the world for the management of Gadget addiction. Cognitive behavioral therapy normally allows addicts to understand addictive feelings and actions while learning new coping skills and ways to prevent a relapse[36]. There are five stages to change behavior, namely 1) Pre-contemplation- Therapists focus on breaking denials that there are serious problems with Gadget use; 2) Contemplation- Recognize the need for change, but the desire to change may not be substantial and feeling or overwhelming may exist, 3) Preparation- Individual is ready to make a plan to overcome the problem, 4) Maintenance- It begins when the individual feels he can control over the use of Gadget and puts less energy into behavior change 5) Termination - Termination has the purpose of preventing recurrence[37]. Cognitive behavioral therapy is not only effective in reducing addiction but it is helpful to improve the quality of mental and physical health [38]. Though there are many benefits of CBT it is costly therapy and takes an hour for each session. Also, it requires a trained health professional, which is a challenge in a rural area. And cost-effectiveness of this therapy is also a challenge in developing and underdeveloped countries.

2.6. Pharmacological therapy

Previous researchers use Antidepressants and Antianxiolytic drugs for the management of Gadget addiction[39]. But long-term use of these drugs could arise safety issues.

2.7. Ayurveda Intervention for Gadget Addiction

Ayurveda Acharya does not mention special De-addiction therapy, but how to omit bad habits and adopt good habits is mentioned by *Acharya Charaka* and *Vagbhata*. As well as in Ayurveda science Satvavajaya*Chikitsa*also focuses on adopting a healthy lifestyle. Our ancestors aimed to develop *Yoga* practices to control their minds so that they could conquest their minds and adopt good things or lifestyles.

2.8. Ayurveda Non Pharmacological treatment

2.9. PadamshikKrama

It is the simple method to transition from unwholesome things to adopting wholesome things by 1/16th, part [40]. After

that, bad habits or things should be left, and good habits should be adapted in a *Padakarma,* i.e., practically in Gadget addiction, the total time spent daily on Gadgets should be reduced by 1/16th part-time daily, and it is replaced by good habits or creative activity.

2.10. SatvavajayaChikitsa

Satvavajaya refers to the method of gaining control over the mind or victory over the mind[41-42]. *Ashwasana* (Ashwasana)*, PratidwandaChikitsa*(Replacement of emotions)*, Chintya (*presumption)*, Dhyeya*(correction of objectives and ideas), *Sankalpa*(proper guidance and advice for taking the right decision), *Dhriti*(proper control of patience) are the practical approaches of *Satvavajaya Chikitsa*[43]. *Acharya Charaka* includes various psychological techniques under the *Satvavajaya*, among them *Ashwasana*(reassurance and explanation), *Suhritvakya*(guidance and suggestion), *Dharmarthavakya*(education of individual and family), *Ishtavinashana*(verbal shock), *AdbhutDarshana*(showing extraordinary things) and *Santwana*(rehabilitation and assurance), *PratidwandaChikitsa*(replacement of emotions) could be beneficial in the management of Gadget addiction. Applying the above methods could change children's thinking and restrain them from unwholesome things. It could be beneficial in the management of Gadget addiction. Changing the thinking power of a patient is very important in the case of any addiction; this will happen with the help of *SatvavajayaChikitsa*. Another benefit of this *Chikitsa* is it requires minimal infrastructure; patient's relatives can be trained easily to give *SatvavajayaChikitsa* to patients. And the rules to follow under this therapy have been in practice traditionally since ancient times; hence there is no hesitation among the patient and his relative to adopt this therapy. Previous studies on *SatvavajayaChikitsa* suggest that it helps to improve the short-term memory of a person[44]. As well as *Satvavajayachikitsa* is proven to be beneficial in the management of *chitodvega*.[45]

2.11. Yoga therapy

Acharya Patanjali defines *Yoga* as *Yogahs-chitta-vritti-nirodhah*, i.e., the method to control over mind and thinking process. *Yoga* is not related to physical exercises only. Still, it is having total 8 steps as follows *Yama* (Code of self-regulation), *Niyama*(Self-training), *Asana* (Meditation posture), *Pranayama (*Breathing exercise), *Pratyahara*(Withdrawal of senses), *Dharana*(Concentration), *Dhyana*(Meditation), *Samadhi* (Self-realization or Enlightenment)[46]. *Yoga* is capable of detoxifying our mind, soul, and body and controlling emotions; this phenomenon is useful in addiction craving, compulsive behavior, tolerance, and relapse. Mental stress and depression are common trigger factors for addictive behavior. Consistency in the practice of *Yoga*, the alpha, beta, and theta brain waves are activated; these have been linked to improvement in both memory and mood and anxiety [47]. *Yoga* intervention effectively enhances self-esteem, emotional regulation, and positive feelings[48]. This phenomenon will help in reducing Gadget addiction. Prolonged internet addiction reduces the grey matter volume in the brain[49]. Meditation practice increases gray matter volume and reduces age-related cognitive decline[50]. Hence *Yoga* is useful for de-addiction and has a role in managing the adverse effect of Gadget addiction.

2.12. AacharRasayana

AacharRasayana is the Ethical principle that controls doing wrong things. And Prevents *Pragyaparadha*, *Asatmendriyarthasamyog*, and *Parinam* by explaining Do's and Don'ts, which leads to good physical and mental health[51]. *AcharaRasayana* gives us tools to find equilibrium in our daily life. Behavioral medicine plays an important role in addressing the challenge we face today in dealing with Gadget addiction stemming from stressful life resulting from an unhealthy lifestyle[52].

2.13. Ayurveda Pharmacological Treatment

2.14. Medhyarasayana

*Medhyarasayana*is made up of two words *Medha*(intellect) and rejenuvating; hence *Medhyarasayana* means the drugs which promote *Medha*(intellect). *Medha* is having of *DheeDhruti*and *Smriti* as its component [53]. *Smriti* seems to be used in the sense of 'recall' only. Still, where *Smritibhramsha* is described in *Prajñâparâdha,* i.e., deranged intellect, control, and memory, commentator *GañgâdharaRâi* opines that "the subject to be remembered, is retained only in the absence of *Smritibhramsha* and at times if the person due to *Dhî-DhritiBhramsha* gets engaged with unrighteous deeds then also he prevents himself from doing so under proper *Smriti.* [54] While assessing the clinical features of Gadget addiction, it can be concluded that many features of Gadget addiction are similar to clinical features of *Raja* and *Tama Guna* predominance[55]. Hence to achieve a normal mental equilibrium, we need to increase *SatvaGuna* and decrease *Tam* and *Raja Guna*. It can be possible by utilizing *Medhyarasayana* and proper counseling, assurance, *SadvrittaPalana,* and *Dhyana*[56]. As well as the relationship between stress, depression, and anxiety with addiction is proven in various studies. These *medhya* drugs are proven anti-depressants, anti-stress and anti-anxiety action[57], with no side effects; hence these drugs are a good choice for children as pharmaco therapy for Gadget addiction.

3. DISCUSSION

Addiction is a psychological condition that manifests as recurrent behavior (such as drug use or gambling) that significantly impairs or distresses the individual on a therapeutic level.[58]Gadget Addiction in children is a growing issue. Multiple factors are responsible for Gadget addiction in children. Data from the Adolescent Health Unit (A.H.U.) in Greece show that the problem is more prevalent in males, particularly in families with dysfunction and kids that are depressed or distracted-hyperactive. Additionally, contextual issues such as a lack of communication and parental boundaries have been linked to Gadget addiction[59]. Gadget-addicted peoples are more likely to experience depression and sleeplessness.[60] Gadget addiction affects the body, mind, and brain, as well as the social behavior of an addicted child. People who use electronic devices excessively get musculoskeletal ailments. Repetitive strain injury (RSI) is a chronic disorder that develops as a result of long-term, violent, or awkward hand motions. RSI can cause discomfort, weakness, numbness, or impaired motor function by damaging the muscles, tendons, and nerves in the neck, shoulder, forearm, and hand.[61] Play Station thumb and 'cell phone thumb' are examples. RSIs were reported among teenagers in 2009. Who used a PlayStation for video gaming and a mobile phone for texting for an extended period.[62]

Common manifestation of excessive use of Gadgets on the eye is Computer vision syndrome, caused by prolonged use of electronic devices and manifests as eye strain, dryness, irritation, burning sensation, redness, blurred vision, and double vision.[63] More screen time and less reading time were related to impaired brain connections between areas governing word recognition and language and cognitive control in a study of children aged 8 to 12 years.[64] Gadget addiction also affects the white matter of the brain [65] Gadget addiction is associated with decrements across a range of neuropsychological domains. [66]This changes in brain regions involved in executive attention, decision-making, emotional processing, and cognitive control [67]. The physical issues associated with internet addiction differ from those associated with other addictions, such as alcohol. Still, the social issues are similar to those associated with other well-established addictions. Loss of control, cravings and withdrawal symptoms, social exclusion, marital discord, academic failure, excessive debt, and job termination are just a few of the effects.[68]*Heena* (Less), *Ati* (Excessive), and *Mithya* (Inappropriate) *Yoga* (combination) of *Indriya* (Sense organs) and *AstmayeindriyarthSamyoga* (Indulgence in unhealthy subjects of sensory organs) have been dealt with in Ayurveda and can be related to addiction concerning the sensory as well as motor-related dysfunctions.[69]Ayurveda is used to aid in the recovery of addicts. Since everyone's *Dosha* balance is different, there is no one universal course of therapy for addiction. However, the following components are typically found in an Ayurvedic addiction treatment program.*Padamshikkrama*, explained by *Acharya Charaka*, is not only for *Ahara*but includes the *Vihara*of a person. Sudden stoppage of Gadget uses in an addicted child increases craving, impulsivity, irritability, anger, and discomfort. However, gradually decreasing this Gadget use time and replacing this time with other activities will not cause mental imbalance. *SatvavajayaChikitsa*triggers the consciousness, acts at the level of judgment, discriminates the negative/maladaptive thoughts, brings firmness, strength, and stability, and finally restrains the mind from unwholesome objects [70,71]. *Yoga* is very effective in addictive behaviors. *Yoga* promotes relaxation and lower breathing rate and focuses on the presence and inhibition of the sympathetic area of the hypothalamus.[72] *Yoga* and mindfulness practices can improve skill, insight, and self-awareness, integral to treating addictions and relapses.[73]*Medhyarasayana* acts in multiple ways, such as increasing *Sadhaka Pitta* and *MajjaDhatvagniVardhana*, which promotes *Medha*[74]. As well as it cleanses *ManovahaStrotasa*, which leads to an equilibrium of *Satva Raja* and *Tama guna*. *Medhyarasayana* has proven to calm action over the brain and is useful in reducing mental irritability and anger. This phenomenon is useful in managing craving Gadget addiction. *Aachararasayana* rules are related to following good behavior over bad behavior. Rules of *achararasayana* are related to *the Dhee and Dhriti* of a person as well as it is related to the good social behavior of a person hence application of its principle can play a crucial role in the management and prevention of socio-behavior abnormalities like addiction. Any addiction harms society; the physician must de-addict a person as early as possible. De-addiction therapy is challenging for the physician, patient, and relatives because it needs infrastructure, trained professionals, and serious efforts from patients and their relatives. In developing countries, all the health streams focus on controlling infectious diseases and other diseases with high mortality. Hence they are lacking in infrastructure and trained professionals for de-addiction. Ayurveda interventions like *Satvavajaya* (psychotherapy) and Yoga*, Medhyarasayana, and AacharRasayana*will benefit patients and require minimal infrastructure, and most of the interventions among these are free. As well as the importance and method of *Yoga* are popularly known among Indians and many people are practicing it readily hence it will be easy for a patient to adopt such measures.

4. CONCLUSION

Ayurveda health stream has a powerful pharmacological and nonpharmacological method for managing Gadget addiction in children. From the above discussion, it can be said that application of *Ayurvedic* interventions is convenient to the patient, requires minimal training for parents, and is cost-effective too. Children are future adults and hence need to focus on their mental and social development to build a healthy and creative generation. These adverse effects of Gadget addiction not only hamper the growth and development of children but also hamper the nation's future. Hence, it is the need of the hour to de-addict the child timely with minimal infrastructure and affordable to economically poor people. Gadget addiction in children is associated with many behavioral diseases, and no cost-effective, convenient therapy is available; this study will help fill the gap.

5. AUTHORS CONTRIBUTION STATEMENT

The notion that was given was created by Dr. Prasad Yewale. He created the theory and carried out the calculations. Dr. RenuRathi approved the analytical techniques, pushed Dr. Prasad Yewale to research the idea, and oversaw the conclusions. Each author contributed to the final text and talked about the findings.

6. CONFLICT OF INTEREST

Conflict of interest declared none.

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