

DESIGN CONSIDERATIONS FOR A DENTAL HEALTH CARE CENTER FOR PATIENTS WITH SPECIAL NEEDS

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Abstract: Out of 121 million population, 2.86 crore accounts for disabled people which 1.21% of total population. It has been reported that oral health care status of disabled people are poor than non disabled population. The main reason for this situation is the barrier to access health care centres. This article throws light on definition and types of disability listed by the Indian government. It also highlights the prevalence of disability and their oral health status. This article focuses on the barriers to access dental care and guidelines required to build a disable friendly dental health care delivery center to make the treatment acceptable for such patients. It is essential to provide dental care to such patients by overcoming the barrier to accessibility. Before motivating the patients and caregivers, it is the dentist who has to be motivated first in fulfilling special health care needs of patients resulting in improvement of the quality of life.

Keywords: developmental disability, oral health status, architectural barrier, design consideration.

Introduction

Health is a term that encompasses multiple dimensions apart from the absence of a disease or infirmity. It represents physical, social and mental well being of an individual (Park, 2017). Healthy individuals form a healthy society which in turn produces healthier individuals. The general health status of a person is often affected by poor oral health, and this relation is vice versa. Hence maintaining good oral health becomes essential for one to lead a healthy life. Providing oral health care to all the people in a community is imperative to build a healthy society (Bharathi & Abhinav, 2012).

However, studies of literature show that children with special needs receive inadequate oral health care when compared to the non disabled population. What makes it more ominous is the fact that children with special needs have a higher incidence of dental caries, periodontal diseases or dental trauma (Ajay, Manish, Sudhanshu & Kothari, 2011). The encumbrance of the oral diseases in these individuals adds to the existing psychological, emotional and financial burden caused by the already existing medical condition.

Oral health of a person not only influences general physical health, it also has a strong impact on the psychology and social behavior of the person (Bharathi & Abhinav, 2012). Unfortunately, oral health care needs of individuals with special needs are plenty yet they remain unattended. The main contributing factor to this is the presence of obstacles at the level of gaining physical access to the dental clinic. Literature shows that one of the most significant challenges faced by patients with special needs is the access to dental clinics for treatment (Adyanthaya, Sreelakshmi, Ismail & Raheema, 2017).

This review paper highlights the prevalence of individuals with special needs, their oral health status, and the design considerations for building a disable friendly dental clinic.

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Defining disability

WHO explains disability as an existing difficulty in performing one or more activities which, in accordance with the subject's age, sex and normative social role, are generally accepted as essential, basic components of daily living, such as self-care, social relations and economic activity (WHO report on disability, 2011).

Thus disability could lead to activity limitation that precedes participation restriction. Hence disability cannot be merely called a disease; it is a complex phenomenon hindering the physical needs of the individual and his/her interaction with the society. This review throws light on challenges faced by individuals with special needs at the point of delivery of dental care.

Epidemiology

Right to Disability Act was formulated at New Delhi in the year 1995 which lists 7 disabilities under the Act which includes blindness, low vision, leprosy cured patients, hearing impairment, locomotor disability, mental illness and mental disability.

This Act was later changed into Disability Act whose bill for the amendment was drafted by the legislation in 2010, but the change was put into force by 2010. The bill has been brought to comply with the UN convention on the right of persons with disabilities, to which India became signatory in 2007. The 2014 bill expanded the definition of disability with 19 other conditions which include blindness, low-vision, leprosy cured persons, hearing impairment (deaf and hard of hearing), locomotor disability, dwarfism, intellectual disability, mental illness, autism spectrum disorder, cerebral palsy, muscular dystrophy, chronic neurological conditions, specific learning disabilities, multiple sclerosis, speech and language disability, thalasemia, hemophilia, sickle cell disease, and multiple disabilities including deaf and blindness.

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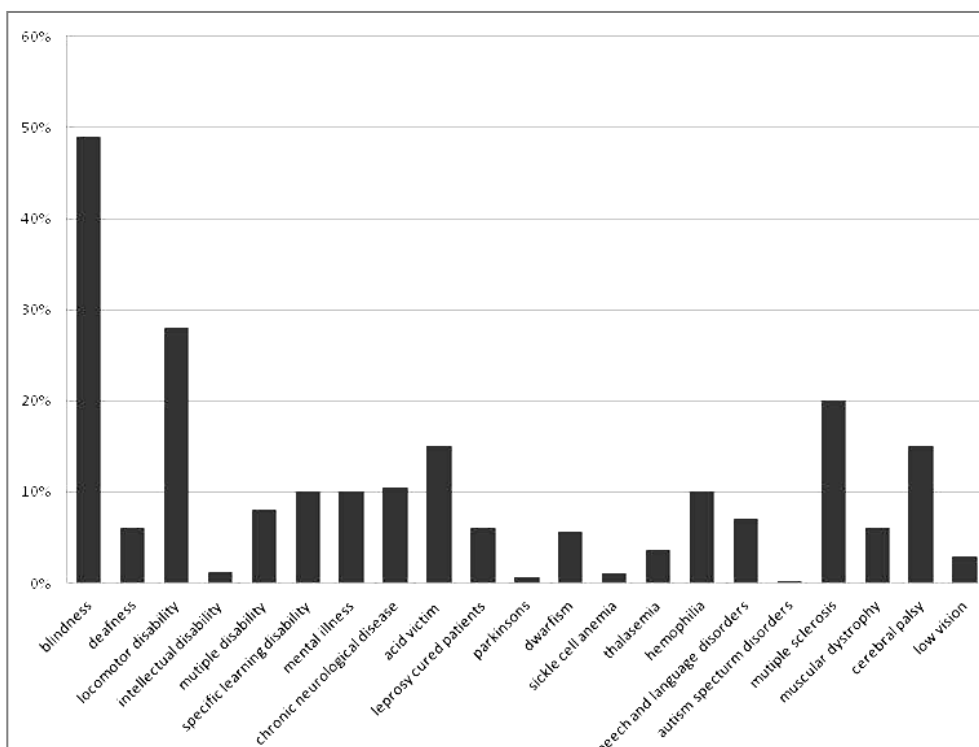
It also emphasized on schemes to ensure barrier-free access in buildings, transport systems and all kind of public infrastructure, and not to discriminate against the disabled in the matter of employment.

The 2011 census put the number of disabled in India as 2.86 million which is 2.21% of the population. This is a gross underestimation, under the light of proposed amendments which significantly widen the current census definition of disability.

Therefore this Act was again modified in the year 2016 by Lok Sabha in which the following 2 disabilities were added: victims of acid attack and Parkinson's disease.

Though these amendments rightly recognize wider range of disabilities, they fail to specify the degree of disability. Furthermore, there are no suitable tools to quantify disabilities like autism or learning disabilities.

Figure 1. Prevalence of the 21 disabilities listed in Disability Act 2016 in India. Source: Harmonized Guidelines And Space Standards For Barrier Free Environment For Persons With Disability And Elderly Persons (2016) Government Of India Ministry Of Urban Development.



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Oral health status of the people with special health care needs

People with special health needs form a substantial part of the community in the Indian population. Patients with special needs in any form have poor oral health (Vignehsa, Soh, Chellappah, 1991.) This could be a direct impact from the underlying medical condition or an indirect effect due to inability in practicing oral hygiene measures. Various studies have been conducted among different sectors of individuals with special needs, and it can be concluded that incidence of dental caries is most followed by periodontal diseases, trauma and malocclusion (Vyoma, Nagashree & Rekha, 2017.)

Table 1. Prevalence Of Oral Manifestation Among The Disabled Population.

Disability	Most prevalent oral manifestation	Prevalence percentage	Author
Blindness	Trauma	39%	Muhot.H (2017)
Deafness	Dental caries	65%	SandeepI(2016)
Locomotor disability	Gingivitis	88.9%	Bhatia.R (2016)
Intellectual disability	Periodontal disease	69%	Abhisekh .M (2015)
Mutiple disability	Dental caries	89.8%	Bharathi .M(2012)

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Disability	Most prevalent oral manifestation	Prevalence percentage	Author
Specific learning disability	Dental caries	39.58%	Aditi .M(2017)
Mental illness	Gingivitis	58.82%	Aditi .M(2017)
Leprosy cured patients	Periodontitis	78.25%	Rawlani Sm (2011)
Parkinson's	Sialorrhea	56%	Ujawala .R(2017)
Dwarfism	Periodontal disease	98%	Franco .F(2017)
Sickle cell anemia	Gingivitis	21.5%	Jaideep.S (2013)
Thalasemia	Dental caries	34%	Jaideep .S(2013)
Hemophilia	Hemorrhages	72%	Nagaveni NB (2016)
Speech and language disorders	Dental caries	31.27%	Aditi .M(2017)
Autism spectrum disorders	Occlusal anomalies – crowding	33.85%	Aditi .M(2017)
Multiple sclerosis	gingivitis	15.3%	Eva santa.E(2012)

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Disability	Most prevalent oral manifestation	Prevalence percentage	Author
Muscular dystrophy	Malocclusion-open bite	86%	Morinushi .T(1986)
Cerebral palsy	Malocclusion – class 1	82.62%	Aditi .M(2017)
Low vision	Trauma	39%	Munhot .H (2017)

The significance of oral health

Oral health is an integral part of general health and has a notable influence on the quality of life (Mehta, Ahishek, Gupta, Radhika, Mansoob, Saleha et al 2015). Individuals with special needs have plenty of oral health burden as mentioned previously (Table 1). The reason behind this incompetence is the diminished dexterity due to lack of concentration, uncoordinated muscular movement, and deficient neuromuscular or neuromotor skills. The impact of dental disease in individuals with special needs is more than that in individuals without disability. Maintaining optimal oral health is mandated to combat against the side effects of essential and regular medications taken by the individuals with special needs. Dry mouth, gingival overgrowth, oral muscle spasms are some of the common manifestations of the medication side effects among the special needs population. Dental related pain is obnoxious and can modulate the behavior of the individuals with special needs eventually minimizing their food intake and nutrition supply (Bharath & Abinaya 2012). This further worsens their existing condition affecting the overall health.

Thus a good oral health is necessary to prevent this vicious cycle. Taking proper care of oral hygiene will make their smile aesthetically pleasing

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thereby boosting their confidence in social life. In summation, preserving a good oral health brings about affirmative changes in all aspects of life of an individual.

Challenges in delivering dental care

There are plenty of unmet dental care needs among the individuals with special needs. Although various reasons account for this situation, a major challenge is personal accessibility to health care society to avail dental care. Most dental care set up are either or partially not accessible to people with special needs (Bhataia, & Matharwala, 2016.) Also, there are no structured regulations set for setting up a health care center. Therefore there is need to eliminate the barriers causing this discrepancy.

Lack of access: The physical barriers of a healthcare set up play a significant role in delivering dental treatments. Architectural designs of healthcare set up in India are not disability friendly, thus worsening the current scenario of delivering dental needs to the individuals with special needs. To combat this situation the Ministry Of Urban And Development, Govt. Of India has formulated guidelines in the year 2016 which provides specifications for building a barrier-free environment thus making health care needs accessible to them.

The panacea for the challenges faced

1. Preliminary examination / assessment

- Thorough anamnesis of the patient should be recorded. Proper understanding of the medical condition is required. Before commencement of any dental treatment, an informed consent should be taken from the caretaker/parent of the patient and a medical fitness certificate issued by a general physician is a must.

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- In case of appointments they should be scheduled in the convenient timing of patient and caregiver (Ajay, Manish, Sudhanshu & Kothari, 2011).
2. Patient management
 - Adhering to the protocol of behavior management eases out the stress on both patient and doctor during treatment procedures (Ajay, Manish, Sudhanshu & Kothar, 2011).
 3. Establishing a disable friendly dental clinic
 - Providing a relaxed, pleasing environment to any patient is important.
 - Physical barriers in the clinical environment cut the access for the patients to dental clinics.
 - Therefore it is desirable to follow the guidelines given by central ministry of urban and rural development and incorporate them thereby constructing a suitable dental clinic for the individuals with special needs.

Guidelines for a friendly dental clinic set up considerations for people with disability

According to Harmonised Guidelines And Space Standards For Barrier Free Environment For Persons With Disability And Elderly Persons (Government Of India Ministry Of Urban Development, 2016) following should be installed in a dental clinic.

1. PARKING SPACE

- Parking space should be provided in the proximity of the clinic preferably within 98 feet distance.

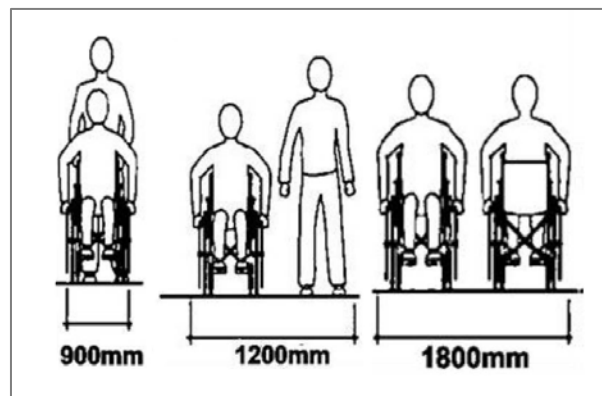
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2. WALKWAY

- Should be smooth, hard and have leveled surface suitable for walking and wheeling.
- Walkways should not exceed 60 meters in length, if exceeded it is desirable to provide rest area adjacent to the walk at suitable intervals of 98 feet for bench/ resting seats. For comfort, seat height should be between 17.6 -19.6 inches, have a backrest and hand rests at 27.54 - inch height.
- Minimum walkway width should be 70.6 inches for two way traffic. However, in exceptional cases (such as around trees/poles etc.), the width could be 59 inches.

Figure 2. Minimum Width Of A Clear Walkway. Source: Harmonized Guidelines And Space Standards For Barrier Free Environment For Persons With Disability And Elderly Persons (2016) Government Of India Ministry Of Urban Development.



3. TACTILE PAVERS: GUIDING & WARNING BLOCKS

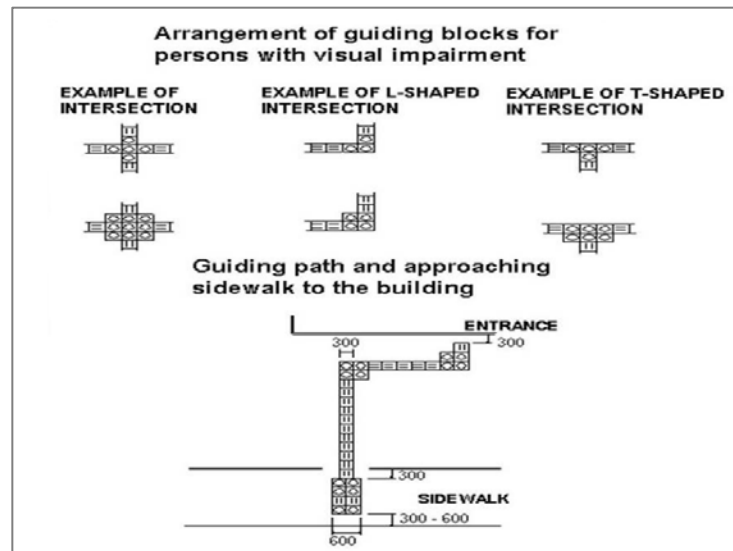
- For visually impaired patients tactile pavers should be used.
- These are of two types; dot type and guiding block type.
- They act as guide in pathway for visually impaired patients.

Figure 3. Configuration And Layout Of Tactile Pavers. Source: Guiding And Warning Harmonised Guidelines And Space Standards For Barrier Free

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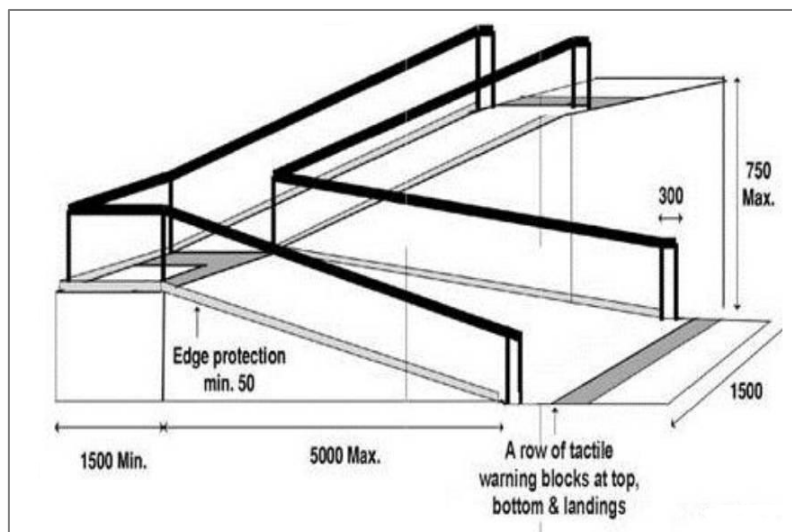
*Environment For Persons With Disability And Elderly Persons (2016)
Government Of India Ministry Of Urban Development.*



4. RAMPS

- A ramp run with a vertical rise greater than 6 inches should have handrails.
- The minimum clear width of a ramp should be 47 inches.

Figure 4. Ramp Design. Source: Harmonised Guidelines And Space Standards For Barrier Free Environment For Persons With Disability And Elderly Persons (2016) Government Of India Ministry Of Urban Development



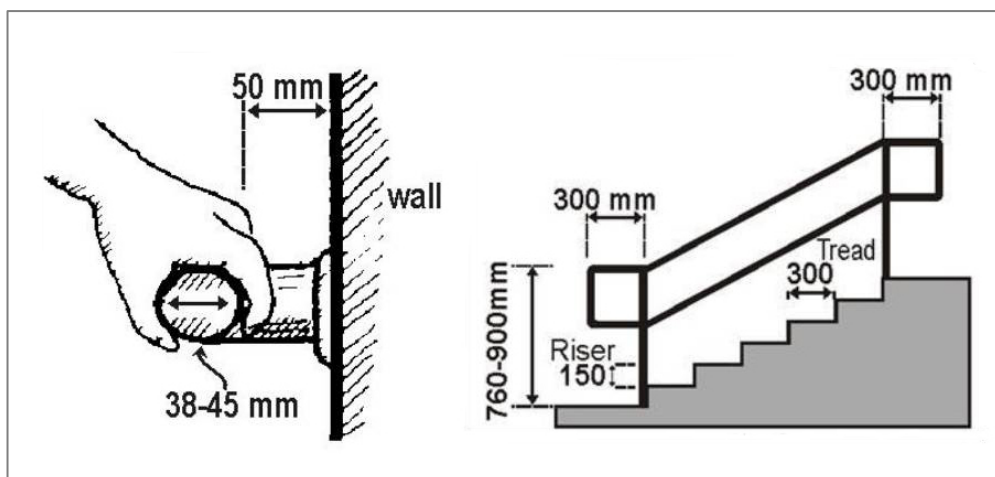
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1. STAIRCASE

- TO BE SUPPLEMENTED WITH RAMP /LIFTS
 - Treads should be 12 inches deep and risers not higher than 6 inches.
 - There should be no more than 12 risers in one flight run.
 - The stairs landing should be minimally 48 inches deep and 60 inches in width.
 - Staircase must have grab bars for holding while walking.
 - The specifications for the grab bars are as follows:
 - Slip-resistant with round ends
 - Have a circular section with a diameter of 1.4 to 1.7 inches.
 - Installed at the height of 30 to 35 inches.
 - They should be able to bear a weight of 550 pounds.

Figure 5. Grab Rail Measurements And Staircase Measurement. Source: Harmonised Guidelines And Space Standards For Barrier Free Environment For Persons With Disability And Elderly Persons (2016) Government Of India Ministry Of Urban Development



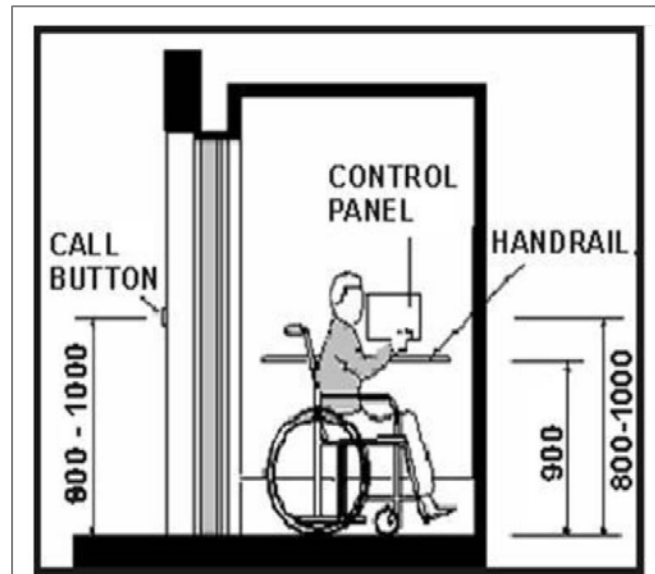
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2. LIFTS

- The minimum size of the lift should be 48 inches wide by 48 inches deep, if possible a 13 passenger lift is to be provided for easy maneuverability of wheelchair

Figure 6. Placement Of Lift Accessories. Source: Harmonised Guidelines And Space Standards For Barrier Free Environment For Persons With Disability And Elderly Persons (2016) Government Of India Ministry Of Urban Development.



3. DOOR

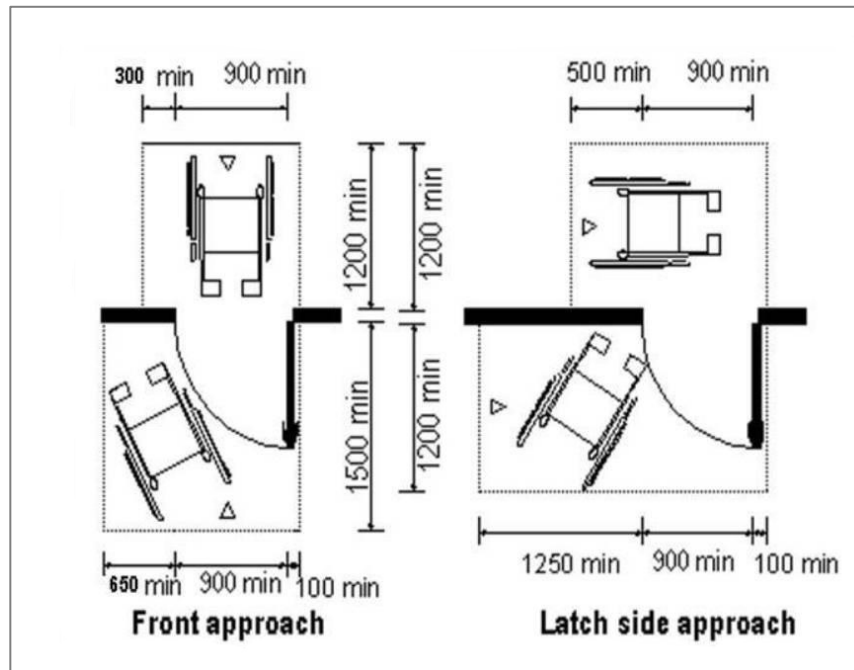
- Use sliding or folding doors. The door should not be too heavy to operate and should not require a force of more than 20N to operate.
- Automatic doors should have a push button system to open them.
- All external doors should have warning blocks installed 30 inches before entrances.
- Minimum opening of doorways should be 35 inches.
- If the door is operated by hand, the handle must be mounted at the height of 33 inches to 43 inches from the floor.

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- For wheelchair users, the door should have a horizontal handle provided on the closing face of the door, approximately 30 inches from the floor.

Figure 7. Maneuvering Space Needed For Wheelchair Users To Approach Doors
.Source: Harmonised Guidelines And Space Standards For Barrier Free Environment For Persons With Disability And Elderly Persons (2016)
Government Of India Ministry Of Urban Development.



4. WAITING ROOM

- CORRIDOR FLOORING

- Complex patterns should be avoided.
- Floors should be leveled with dimensions 35*48 inches. If greater, floor should be designed as a ramp.
- Carpets should be securely fixed and have firm cushion, pad or backing.
- Have exposed edges of carpets fastened to floor surface and trim along the entire length of the exposed edge.

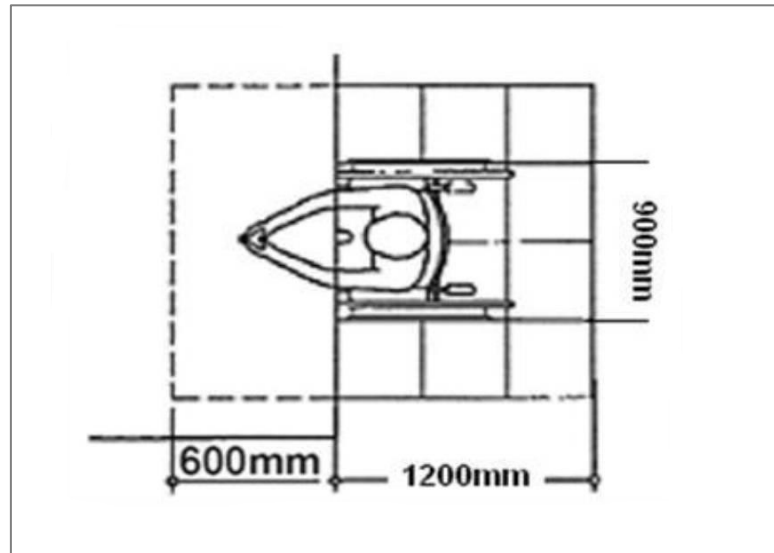
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- LIGHTING

- Lighting must be white (example: high-pressure sodium) with an average lux of 35 to 40. This helps to increase the contrast of the images present.

Figure 8. Clear Floor Space For Wheelchair .Source: Harmonised Guidelines And Space Standards For Barrier Free Environment For Persons With Disability And Elderly Persons (2016) Government Of India Ministry Of Urban Development.



5. OPERATORY ROOM FACILITIES

- TAP

- Either hand-operated or electronically controlled.

6. SIGNS

- Direction signs should be provided at junctions of circular routes and key destinations such as doorways, at reception points, at facilities such as drinking water facility and toilets, etc.

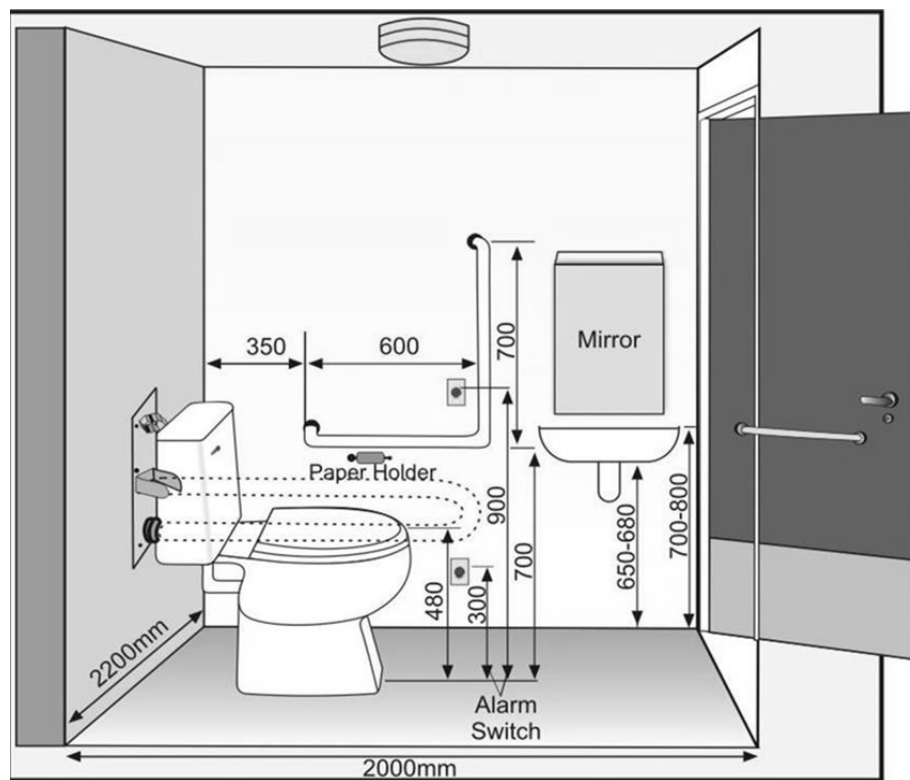
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7. RESTROOMS

- Unisex accessible toilet allows Persons with Disabilities to be assisted by caretakers of the same or opposite gender.
- A minimum internal dimensions of 86 inches * 86 inches is to be present
- Each restroom should have a western closet with grabrails attached to them
- Toilet paper dispenser is to be present at 2 inches to 8 inches height above the top of the closet.

Figure 9. Layout Plan Of Unisex Accessible Toilet. Source: Harmonised Guidelines And Space Standards For Barrier Free Environment For Persons With Disability And Elderly Persons (2016) Government Of India Ministry Of Urban Development.



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Standardised design - ICF aspect

The international classification of functioning, disability and health has refined disability on the basis of Society medicine model. This model states that disability of a person is exhibited due to the environmental factors. Hence, considering this model and the classification, modifications of the dental clinic is standardized broadly to the respective disabilities.

Figure 10. Recommendations of dental clinic based on ICF aspect

Contextual factors	Blindness	Deafness	Physically challenged	Mentally challenged
Positive aspects	TACTILE PAVERS	PLEASANT LIGHTING	WIDE PARKWAYS, RAMPS, AND LIFT	WIDE WAITING ROOM
Negative aspects	SMOOTH FLOORING	DULL LIGHTING	STEPS WITHOUT RAMPS	CONGESTED WAITING SPACE

Dental chair - Design considerations

Exploration of literature reveals that the first dental chair was made in the year 1790 by Josiah Flagg. Over the years dental chair has undergone numerous modifications to accommodate the patient needs and comfort. Analysing the various chair designs gives us an insight that headrests have all along been a hindrance to patient's comfort. Apart from these, transferring a special need individual from their wheelchair to dental chair is strenuous (Paul, 2014.) UK government created a dental chair called DIACO exclusively for wheelchair patients, but the high cost and space occupied by the chair has led to further research (Diacio, 2004.) The chair designed by DIACO company accommodates

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only disabled patients. A portable dental unit was created by Tamazawan et al. (2004) for both general and disabled patients. But designing a universal chair to accommodate all is still an undiscovered mystery.

Considering these modifications, changes can be incorporated in a dental chair to make them friendly for the people with disability as well as use them for general. This can be achieved by making the body rest part detachable such that it could be fitted to the ramp structure for general patients and removed in case of wheelchair patients.

Keeping the above guidelines in mind while setting up a dental clinic will help us to carry out the dental procedures in a better manner, thereby decreasing the prevalence of dental diseases among the individuals with special needs.

Conclusion

There are numerous challenges faced by a practitioner while delivering dental care to patients with special needs. Managing these patients is a herculean task for many. This scenario can be changed by inculcating the protocols in curriculum which would result in better understanding of their medical conditions and helps the clinician to provide good dental treatment. Studies highlight that though dentists show a favorable attitude in treating the patient with special health care needs, only a few private clinics meet the architectural requirements (Adyanthaya, Sreelakshmi, Ismail, Raheema, 2017).

Therefore, forming an exclusive decision-making body to approve or set norms for building a disable free dental clinic is the need of this hour. Thus, increasing awareness about the guidelines among dental practitioners and training them to manage the individuals with special needs patients will bring a huge change in dental care delivery system for the patients with special needs.

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REFERENCES

- [1] Aditi, M . V ,Pal . A, Anmol .M .(2017).Oral Health Status and Treatment Needs among Differently Abled Children . Journal of health science, 2(1), 24-28.
- [2] Ajay , B, Manish . J, Sudhanshu . S, Kothari.(2011).Oral health preventive protocol for mentally disturbed subjects. Journal of advanced dental research 3(1), 21.
- [3] Adyanthaya, A, Sreelakshmi, N, Ismail, S, Raheema ,M. (2017). Barriers to dental care for children with special needs:general dentists'perception in Kerala, India .Journal of Indian society of pedodontics and preventive dentistry,35(3), 216-222.
- [4] Apexa, G.V, Virendra .K.K, Rajagopala, .S, Kalpana , S.P. (2013). Etiopathological study on cerebral palsy and its management by Shashtika shali pinda sweda and Samvardhana ghrita. International quarterly journal of ayurveda,34(1)56-62.
- [5] Benandi,D, Reddy, C.V.K, (2013).Oral health related quality of life. Journal of international society of preventive and community dentistry ,30(1)1-6.
- [6] Bharathi ,M.P , Abhinav, S.(2012).Oral health status of 12year old children with disabilities and control in Southern India.Who south-east Asia journal of public health,1(3),336-338.
- [7] Bhataia.R, Matharwala ,N.R.(2016).The oral health status and treatment needs of institutionalized and non institutionalized disabled children in Navi Mumbai, India. International journal of contemporary medicine research, 3(4).1041-1045.
- [8] Bhullar, D.S. (2014). Acid throwing: a cause of concern in India . Indian journal of clinical practice,24(10).
- [9] Diaco.(2004),The dental chair for wheelchair patients. UK [Brochure]
- [10] Dutta Ray, S. & Mathur, S.B. (1965). Some salient features of a sample of childhood psychoses (schizophrenia) observed in New Delhi. Indian journal of psychiatry, 7(1), 26-30.

Lakshmi, K., Madan Kumar, P., & Das, D. (2018). Design considerations for a dental health care for patients with special needs. *Journal of Accessibility and Design for All*, 8(1), 80-101.

doi:<http://dx.doi.org/10.17411/jacces.v8i1.168>

- [11] Eva ,S.E.T, Eva ,M., Mónica,M.H, Paloma, P.D.P .(2012).Oral health status of a population with multiple sclerosis.Medicina oral patalogia oral cirugia buccal.17(2)E223-227.
- [12] Expert group meeting on disability evaluation and national seminar on disability evaluation and dissemination .(1982), Manual for doctors to evaluate permanent physical impairment.
- [13] Fernante, F, Blasi,S, Crippa,R, Angiero, F. (2017).Dental abnormalities in pituitary dwarfism: a case report and review of the literature. Case repots in dentistry, 1.
- [14] Goueri Dei .M. (2014).epidemiology of neurological disorders in india: review of background, prevalence and incidence of epilepsy, stroke, parkinson's disease and tremors.Neurology India 62(6), 594.
- [15] Government Of India Ministry Of Urban Development (2016). Harmonised Guidelines And Space Standards For Barrier Free Environment For Persons With Disability And Elderly Persons. Retrieved from: <http://cpwd.gov.in/publication/harmonisedguidelinesreleasedon23rdmarch2016.pdf>
- [16] Jaideep,S, Nitin, S, Amit, K, Neal , B.K,Anil, A.(2013).Dental and periodontal health status of beta thalassemia major and sickle cell anemic patients: a comparative study. Journal of international oral health ,5(5). 52-58.
- [17] Park,K.(2017). Preventive and social medicine. Bhanarsidas bhanot publishers, India.
- [18] Karanth P. Learning disabilities in the Indian context. [Online]. 2002 [Cited 2006March]; Available From: March 2010.
- [19] Mehta, Ahishek, Gupta, Radhika, Mansoob, Saleha ,Mansoori, Shahnaz. (2015) . Assessment of oral health status of children with special needs in Delhi, India. South Brazilian Dentistry Journal RSBO,12(3), 244-251.
- [20] Ministry of statistics and program implementation .(2016) ,Disabled population in india :a statistical profile.Retrieved from: http://:mospi.nic.in/sites/default/files/publication.../Disabled_persons_in_India_2016.pd.

Lakshmi, K., Madan Kumar, P., & Das, D. (2018). Design considerations for a dental health care for patients with special needs. *Journal of Accessibility and Design for All*, 8(1), 80-101.

doi:<http://dx.doi.org/10.17411/jacces.v8i1.168>

- [21] Mohanty, D, Colah , R.B, Gorakshakar, A.C, Patel ,R.Z, Master , D.C, Mahanta, J,Muthuswamy,V. (2013). Prevalence of B-thalassemia and other haemoglobinopathies in six cities in india: a multicentre study. *Journal of community genetics*, 4, 34-42.
- [22] Joseph,G ,Ronald, E.C,Frances, S.S,Peter, H. M.(1988).Oral findings and proposal for dental health care program for patients with Duchenne muscular dystrophy. *American journal of orthodontics and dentofacial orthopedics*,93(2),126-132.
- [23] Harsha, M, Alok, A, Nilotpol,K, Rashmi,B, Brij, K, Maylavarapu, K.S. (2017). Prevalence of traumatic dental injuries among children attending special school of Chattisgarh. *Journal of Indian society of pedodontics and preventive dentistry*, 35(3), 209-215.
- [24] Nagaveni, N.B, , Shruthi,A, Poornima,P, Hanagawady, S, Yadav, S.(2016).Dental health in children with congenital bleeding disorders in and around Davangere: A Case-Control Study.*Journal of Indian society of pedodontics and preventive dentistry*, 34(1), 76-81.
- [25] Paul, S.(2014).The Design Of A Disabled Friendly Dental Chair , Ireland. Department Of Mechanical & Industrial Engineering,(Unpublished Master's Thesis) Galway-Mayo Institute Of Technology, London.
- [26] Rights Of Persons With Disabilities Bill.(2016), Government Of India Ministry Of Social Justice & Empowerment. Retrieved from: <http://www.disabilityaffairs.gov.in/upload/uploadfiles/files/RPWD%20ACT%202016.pdf>
- [27] Rohit,B, Prerna,B, Rima,C. (2015). Epidemiology and genetic aspects of multiple sclerosis in India. *Annals of Indian academy of neurology*, 18(5).1-6.
- [28] Roshan, B.C, Malay, B.M, Snehal , M, Kanjaksha G.(2015).Sickle cell disease in tribal populations in India. *Indian Journal of Medical Research*,141(5).509-515.
- [29] Rawlani ,S.M, Rawlani ,S, Degwekar , S, Bhowte ,R.R, Motwani,M. (2011).Oral health status and alveolar bone loss in treated leprosy patients of Central India. *Indian journal of leprosy*, 83,215-224.
- [30] Sandeep,V, Manikya,M, Vinay,C, Chandrasekhar,R, Jyostna,P.(2016).Oral health status and treatment needs of hearing impaired children attending a

Lakshmi, K., Madan Kumar, P., & Das, D. (2018). Design considerations for a dental health care for patients with special needs. *Journal of Accessibility and Design for All*, 8(1), 80-101.

doi:<http://dx.doi.org/10.17411/jacces.v8i1.168>

special school in Bhimavaram, India. Indian journal of dental research ,27(1),76.

- [31] Shubha ,P. (2011) .Hemophilia care in India: a review and experience. Indian journal hematology and blood transfusion, 27(3) 121-126.
- [32] Tamazawa,Y,Watanabe, M, Kikuchi , M, Takastu, M,Tamazawa, K,Yumoto, N, Hyvarinen P.(2004). A new dental unit for both patients in wheelchairs and general patients, Gerodontology,21, 53-59.
- [33] Ujwala,R.N, Swapnil,J.K, Arun, S.D, Rohan, D.N.(2017). Oral health issues and challenges in parkinson's disease. International Journal Of Nutrition, Pharmacology, Neurological Diseases,7(3), 54-59.
- [34] Vignehsa, H, Soh,G, Lo, G.L, Chellappah, N.K. (1991). Dental health of disabled children in Singapore. Australian Dental Journal,36(2),151-156.
- [35] Vyoma , G.V, Nagashree,S.R, Rekha,R.(2017) .Barrier free dental health care: a situation analysis of the dental care settings and providers' attitudes in private dental clinics for the movement disabled in Bengaluru City. Journal of Indian association of public health, 15(2),169.
- [36] World Health Organisation, report on disability [Online]. Geneva: WHO.
Available from: <http://www.who.int/topics/disabilities/en/>

Lakshmi, K., Madan Kumar, P., & Das, D. (2018). Design considerations for a dental health care for patients with special needs. Journal of Accessibility and Design for All, 8(1), 80-101.

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