Advances in Bioresearch
Adv. Biores., Vol 12 (5B) September 2021: 354-358

Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585.12.5B.354358

Advances in Bioresearch

REVIEW ARTICLE

Oral Manifestations of Endocrine Disorders: A Review report

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ABSTRACT
Vertebrates, glands are classified as exocrine glands and endocrine glands based on the presence or absence of ducts. The glands with ducts are known as exocrine glands, while the ductless glands are known as endocrine glands whose secretions, non-nutrient chemicals commonly known as hormones act as messengers and are secreted in a small amount that is absorbed into the blood circulations surrounding immediately around the gland to reach particular organs to initiate a specific action. In this review report, we shall discuss the various disorders of the endocrine glands in the human body and their manifestations in the oral cavity.
Keywords*: Endocrine Disorders, Hyperthyroidism, Hypothyroidism, Hyperparathyroidism, Diabetes Mellitus, Addison's Disease*

Received 04.06.2021 Revised 22.06.2021 Accepted 19.08.2021

How to cite this article:
D Mohapatra; N Mohanty. Oral Manifestations of Endocrine Disorders: A Review report. Adv. Biores. Vol 12 [5B] September 2021. 354-358

INTRODUCTION

The endocrine glands secrete a non-nutrient chemical known as a hormone in small amounts that acts as messengers and are secreted into the surrounding blood circulation to reach particular organs and initiate a specific metabolic function. Hormones do not provide energy or act as a building material, but they do have a crucial role in the growth differentiation and metabolic activities of the target cells. Decreased secretion of hormones leads to the decreased role of hormones and thus to hypoactivity of hormones, whereas, excessive secretion of these chemical messengers from the glands leads to hyperactivity of hormones. In the following review article, we shall put light on the various changes seen in the oral cavity of human beings due to hypersecretion or hyposecretion of hormones like hyperpituitarism, hypopituitarism or pituitary dwarfism, progeria, hyperthyroidism, hypothyroidism, hyperparathyroidism, hypoparathyroidism, pseudohypoparathyroidism or Albright Hereditary Osteodystrophy, diabetes mellitus, diabetes insipidus, Addison's disease, Adrenogenital syndrome, Cushing's syndrome, hypogonadism, pregnancy and menopause [1].

HYPERPITUITARISM

Hypersecretion from the pituitary gland results from the hyperfunctioning of the anterior lobe of the pituitary gland, most importantly leading to the overproduction of growth hormones. The most common causative factor may be a benign tumour of eosinophilic cells of the anterior lobe of the pituitary gland. Growth hormones act straight on the tissues, but the effects are mostly considered by stimulation of secretion of insulin-like growth factor I (IGF-I) and proteins binding it. Increased activity of growth hormones occurring before epiphysis closure causes gigantism while that occurring in later life after epiphysis closure is termed as acromegaly.

Teeth in gigantism patients are of equal proportion to the size of the jaw and rest of the body, but the roots may be longer as compared to the normal tooth. More spacing in between teeth is noticed which may partly be either due to the increased size of the tongue or partly because upper teeth are located on

the interior aspect of the mandibular arch due to disproportionate enlargement of both the jaws. In edentulous patients, enlargement of the alveolus can cause inappropriate fitting of dentures [2]. Mandibular condylar growth was seen with overgrowth of mandibular bone causing prognathism. Class III malocclusion is a common feature seen due to extraordinary proportioning of mandible creating major discrepancies between the upper and the lower jaw. If the growth of the condyles exceeds that of the alveolar process, there is an increase in the vertical depth of the ramus than that of the body of the mandible, leading to improper occlusion. The angle between the ramus of the mandible and the body increases, resulting in a "fan-out" appearance as roots of the anterior tooth is pushed forward when viewed radiographically. Palatal vaults are usually flattened along with macroglossia and crenation on the lateral border of the tongue, with prominent thick and negroid lips.

HYPOPITUITARISM OR PITUITARY DWARFISM

Hypopituitarism can be seen due to adenoma in the pituitary gland which squeezes the gland causing decreased secretion of hormones from this master gland. The complete absence of secretions from this master gland is known as panhypopituitarism while hypopituitarism occurring after puberty is called 'Simmonds's disease'. In hypopituitarism, the individual is of short stature due to symmetrical underdevelopment. There is marked underdevelopment of the jawbones with a lack of condylar growth and short ramus causing severe crowding and malocclusion [3]. The two important hormones secreted by the pituitary, namely the somatotrophic and the thyrotrophic hormones are accountable for tooth eruption. So. In case of hyperfunctioning of the gland, tooth eruption is hampered, with complete absence of third molar bud in few instances. The proper accommodation of all the teeth gets difficult due to small dental arches causing crowding along with the shortening of roots and widening of root apices [4].

PROGERIA

Progeria or premature ageing is an extremely rare autosomal dominant genetic disorder causing rapid ageing in children with the cardinal cause being completely dependent on pituitary dysfunction [5]. There is the accelerated formation of irregular dentin along with micrognathia and delayed eruption of teeth. Progeria patients are very rare and typically experience anodontia, incomplete formation of roots of primary molars, palatal pseudo clefts, reticular atrophy of pulp, agenesis of permanent teeth, high caries incidence, gingivitis, discolouration and ankylosis [6, 7].

HYPERTHYROIDISM

Also known as 'thyrotoxicosis', hyperthyroidism is acknowledged by the overproduction of thyroxin in the thyroid gland causing an overall increase in the metabolic rate of tissues. In thyrotoxicosis patients, management of dental problems can lead to an acute emergency a situation referred to as 'thyroid crisis' or 'thyroid storm'. In this patient, early dental development is noticed with marked early eruption and premature loss of primary teeth. In some cases, alveolar bone resorption can be marked with generalized decreased bone density and loss of edentulous alveolar bone at some places [8].

HYPOTHYROIDISM

Failure of thyrotrophic functioning of the pituitary gland, atrophy or damage of any kind to the thyroid gland leads to insufficient production of thyroxin by the thyroid gland to meet the requirements of the body. Thyroiditis, insufficient thyroid replacement, thyroidectomy and radioactive iodine therapy can lead to decreased secretions of thyroid hormones, thus causing hypothyroidism. Hypothyroidism occurring in infancy is termed as cretinism, that seen in childhood is juvenile myxedema and if hyposecretion of thyroid hormone is noticed after the onset of puberty, it is termed as myxedema with notable non-pitting oedema due to deposition of glycosaminoglycan ground substance in the subcutaneous layer. In cretinism and juvenile myxedema, dental development is detained along with enamel hypoplasia and abnormal dentin formation. The overdeveloped maxilla is seen whereas mandibular development is delayed. Condylar growth repairment can cause micrognathia, malocclusion and open bite along with continuous protrusion of the tongue [9]. Whereas, in the case of myxedema, lips, as well as the tongue, is enlarged due to deposition of water and protein. The patient has higher chances of occurrence of periodontal diseases, with loosening of teeth and alveolar bone destruction.

HYPERPARATHYROIDISM

Hyperparathyroidism is an endocrine disorder with excessive secretion of parathyroid hormone, that stimulates the osteoclast cells to mobilize calcium from skeletal tissues leading to hypercalcemia as well as increases the renal tubular reabsorption of calcium. In hyperparathyroidism presence of a unique triad

of kidney stones, resorption of bones and duodenal ulcers is seen. The occurrence of Brown tumour can be seen peripherally or centrally, which is detected as a swelling that may be intraoralor extraoral. There is loosening of teeth with gradual drifting and loss of teeth [10, 11].
During the radiographic examination, the bone matrix contains less amount of calcium than normal producing usually radiolucent skeletal images. The rarefactions are homogenous with a normal, glandular or ground glass appearance. Radiographically, the brown tumour appears as an ill-defined radiolucency, in which the trabeculae are completely missing [12, 13]. The most common site of appearance is the facial bones and the jaws, with variably defined margins and unilocular or multilocular appearance that may produce cortical bone expansion. The lining of the maxillary sinus becomes thin with added demineralization of the inferior border of the mandible. Since the alveolar bone is largely affected, mobility of teeth including loss of lamina dura around one or more teeth can be detected.

HYPOPARATHYROIDISM
Hypoparathyroidism is a not so common disease, in which there is deficient parathyroid hormone secretion giving rise to hypocalcemia [14]. Hypoplasia of enamel is seen with delayed tooth eruption, external root resorption as well as root dilaceration. Chvostek sign is a common feature of hypoparathyroidism, in which a single nudge over the facial nerve can cause twitching of facial muscles around the oral cavity [15, 16]. Chronic candidiasis can be sometimes seen in the case of hypoparathyroidism associated with endocrine-candidiasis syndrome.

PSEUDOHYPOPARATHYROIDISM OR ALBRIGHT HEREDITARY OSTEODYSTROPHY
Albright Hereditary Osteodystrophy is also known as 'acrodysostosis', in which parathyroid secretion is normal, but, the biochemical pathway accountable for operating the target cells are flawed in function. The patient manifests a short stature due to the early closure of specific bony epiphysis. Midfacial hypoplasia is noticed with generalized enamel hypoplasia, delayed tooth eruption, oligodontia, enlarged pulp chamber, early tooth loss and shortening as well as widening of the jaw with added radiographic appearance of dagger-shaped calcification in the pulp of teeth [17].

DIABETES MELLITUS
Diabetes mellitus is a common endocrine disorder specified by long-standing hyperglycemia as well as irregularity in carbohydrate and lipid mechanism evolving due to insufficient insulin in the body or insulin ineffectiveness causing hyperglycemia and glycosuria. Diabetes mellitus can be of two types, namely, type-I or insulin-dependent diabetes mellitus resulting from insulin deficiency and type-II or non-insulin-dependent diabetes mellitus occurring due to resistance to insulin in the body. A larger degree of differences is seen in the oral cavity in case of uncontrolled diabetes mellitus if rendering proper case is prohibited [18]. Patient with diabetes mellitus is more liable to have periodontal diseases as it does not directly cause periodontal issues but changes the responses of periodontal lesions to irritants present locally, fastening loss of bone and retarding post-surgical healing [19].
Diabetes also causes abnormalities in vasculature in periodontal tissues, deregulates the normal production of cytokines and growth factors, decreases collagen synthesis, depresses the immune response and causes changes in the functioning of host defence cells. Median rhomboid glossitis is also encountered in diabetes patients. Infection of *Candida albicans* hastens due to increased local multiplication, impaired glucose levels and improper immune mechanism giving rise to oral candidiasis [20]. Due to delayed healing and impaired immunological balance, dry socket occurrence is a common phenomenon in diabetic patients after undergoing surgical extraction. Burning sensation in the mouth, atypical paresis, dysesthesia, dysgeusia, diabetes neuropathy, xerostomia, diabetic sialodenosis, angular cheilosis, alteration in taste perception and increased caries incidence are some of the prominent oral manifestations seen occurring in this common endocrine disorder [21].

DIABETES INSIPIDUS
Diabetes insipidus occurs due to a shortfall of hormone from the posterior pituitary. Increased thirst, frequent urination, dehydration, headache, irritability and fatigue are the common symptoms of diabetes insipidus [22]. Chances of diabetic coma or insulin shock during dental procedures are more in the case of these patients. Delivery of dental treatment should be done accordingly to cut down disruption of metabolic balance.

ADDISON'S DISEASE

Addison's disease also known as chronic adrenal deficiency of the adrenal cortex can be either an autoimmune disorder or caused due to infection like tuberculosis, deep fungal infection, metastatic carcinoma, intradermal haemorrhage, hemochromatosis, amyloidosis, adrenal infarction or congenital adrenal hypoplasia. The disease is specified by bronzing of the skin along with the appearance of pigments over oral mucosa [23]. There is a pale or deep chocolate colour tinge of the mucosa of the oral cavity, in developing gingiva, tongue and lips, and can act as first evidence in the detection of the disease. Acanthosis along with silver positive granules can be seen in cells of stratum germinativum when a biopsy of the oral lesion is done.

ADRENOGENITAL SYNDROME

Adrenogenital syndrome is marked by a situation where there is overproduction of androgens, affecting a child's normal growth and development with the premature eruption of teeth.

CUSHING'S SYNDROME

Cushing's syndrome occurs due to excessive secretion of glucocorticoids by the adrenal glands as a result of which there is weight loss, moon face, the appearance of buffalo hump at the neck base, dusky plethoric appearance along with purple striae formation in the abdomen, retardation of skeletal as well as dental age, generalized osteoporosis, osseous demineralization with jaw showing areas of loss of lamina dura [24].

HYPOGONADISM

The superciliary ridges, mandibular bone as well as molar shows a higher degree of development in hypogonadism. Pointed chin and markedly high arched palate can lead to irregularities of dentition. The mandible is enlarged with short rami in males having hypogonadism.

PREGNANCY

Pregnancy causes physiological changes in all the areas relevant to a dentist. Marked changes in the hormonal levels in the female body modify the responses of the periodontium [25]. Pregnancy gingivitis is one of the most commonly detected oral complication manifested during this period presenting itself with fiery red swollen gums, aggravated due to magnified inflammatory response of the gingiva to bacteria and plague. Oral prophylaxis and scaling should be done regularly to limit gingival inflammation. Stressful dental procedures, dental radiographs and x-rays of any kind should be avoided during the gestation period [26, 27].

MENOPAUSE

Menopause begins between 40 to 55 years of age when menstrual function ceases, causing numerous disorders associated with estrogen deficiency. Irritability, insomnia, osteoporosis, back and joint pain are some of the features encountered during menopause along with burning sensation in tongue and mouth, abnormalities in taste sensation and dryness of oral mucous membrane. Desquamative gingivitis can also be noticed in which there is shrinkage in the size of the gingiva and ulceration of the gingival tissues along with the presence of bleeding [28, 29].

CONCLUSION

The endocrine system is specifically designed to amalgamate the countless metabolic activities in the human body. Sometimes excessive production or insufficient release of chemical messengers or hormones from these glands can lead to endocrine disorders, the signs and symptoms of which can be manifested clinically, orally as well as radiographically.

FUNDING: None

CONFLICTS OF INTERESTS: Nil

ACKNOWLEDGEMENTS: None

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