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Review Article

Effect Of Punica Granatum In Treatment Of Oral Cancer - A Review

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Abstract

Patients being treated for oral cancer are not currently making progress in terms of survival. That is why scientists are constantly hunting for novel anti-cancer medications that are either natural products or derivatives of natural products. Cancer prevention and treatment have focused a lot of attention on naturally occurring substances found in dietary fruits and vegetables. Unlike costlier chemotherapeutic agents which may cause serious side effects, these natural treatments are both safe and affordable. Pomegranate and its components have an anti-tumorigenic impact, according to studies. Its role in the prevention and treatment of oral squamous cell carcinoma as a chemotherapy adjuvant is highlighted in this review.

Keywords: Punica granatum, Oral Cancer, Treatment, Pomegranate.

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INTRODUCTION

Pomegranate has been utilised in various medical systems for treating a wide range of illnesses and diseases. A deciduous tree in the Lythraceae family produces the historic pomegranate (Punica granatum L.). The fruit pomegranate is well known for its positive impact on health. The peel, leaves, root and pulp of the pomegranate have all been utilised in traditional medicine. Pomegranate extract has been said to have significant medicinal benefits [1].

It is used as a "blood tonic" in Ayurveda medicine and is viewed as "a pharmacy unto itself" to treat a variety of illnesses. Pomegranate polyphenols which are extracted from the fruit offer wide beneficial qualities including antibacterial, antioxidant, anti-inflammatory, antiproliferative, and DNA repair activities [2]. As a result, they provide an excellent substitute for systemic medications. It was advised to use it as an antiparasitic drug, as a treatment for diarrhoea and to prevent and treat ulcers [3,4]. Another conventional medical system known as Unani acknowledges the value of pomegranates in the management of diabetes [5]. All portions of pomegranate are intensively used in traditional medicine. Pomegranate fruit, juice, extract and oil have been found in studies to have anti-carcinogenic characteristics by altering various signalling pathways [6].

CHEMICAL COMPOSITION OF POMEGRANATE

Polyphenols such ellagitannins, punicallin, punicalagins and gallotannin are abundant in pomegranates. Conjugated fatty acids like punicic acid, non-conjugated fatty acids like linoleic acid, oleic acid and palmitic acid, sterols, 17-Estradiol, testosterone and phenyl aliphatic glycosides are present in Pomegranate seed [7]. The peel of pomegranates contains phenolic acid as well as cinnamic acid, chlorogenic acid, coumarin acid, ellagic acid, gallic acid and other fatty acids. Pomegranate leaves contain glycosides, flavones, and tannins (punicalin and punicafolin) [8,9]. Anthocyanins, ursolic acid, ethyl brevifolin- carboxylate and triterpenoids are found abundant in pomegranate flowers. Ellagitannins including punicalin and punicalagin and several piperidine alkaloids are present in the roots and bark of pomegranates. Fruit contains substances such quercetin, kaempferol, luteolin, myricetin, corilagin, anthocyanins, ellagic acid derivatives and hydrolysable tannins.

EFFECT OF POMEGRANATE IN DENTAL TREATMENT

It has been demonstrated that P. granatum reduces gingival bleeding and lowers the risk of periodontal disease progression. It has remarkable wound healing capabilities and is frequently used for ulcers, ulcerative stomatitis and oral lesions among other conditions. Rinsing with pomegranate juice was found to increase ceruloplasmin activity and decrease salivary-glucosidase activity, an enzyme that breaks down sugar (an antioxidant enzyme) [10]. Pomegranate extract was found to be extremely useful in the treatment of denture stomatitis linked to the fungus candida. The human salivary enzyme amylase (which acts as a substrate for cariogenic bacteria) has been discovered to be inhibited by tannins from pomegranate fruit [11,12]. Punica granatum extract was found to considerably alleviate the clinical indications of chronic periodontitis in a study by Shastravaha et al. [13].

POMEGRANATE AS AN ADJUVANT IN TREATING OSCC

Pomegranate extract offers natural products that are high in antioxidants [14] and has anticancer actions on a variety of cancer cells [15,16,17]. Few researchers have treated cells with pomegranate extract and their findings indicate that this inhibits mitochondrial function by inducing ATP depletion as well as reductions in mitochondrial mass, mitochondrial DNA copy number and biogenesis. Additionally, pomegranate extract incubation in oral cancer cells caused DNA damage to both the nuclear and mitochondrial levels. Oral cancer cells are more susceptible to apoptosis and antiproliferation effects from pomegranate extract due to decreased mitochondrial function.

The anti-tumour effects of Punica granatum extracts are mediated by 3 main mechanisms viz. activation of apoptosis, suppression of proliferation and inhibition of invasion [18]. Punica granatum extract acts by inducing apoptosis through oxidative stress. This mechanism involves the production of H2O2 and the depletion of glutathione and it has been observed in a study on OSCC cell line by Weisburg et al., 2010 [19]. As a result, an increase in ROS in oral cancer cells would be the primary cause of apoptotic processes, which also result in a decrease in the quantity of DNA copies in mitochondria. Induction of apoptosis was found higher than that of single compounds [20].

Additionally, a decrease in mitochondrial mass caused by the suppression of mRNA would have a suppressive effect on mitochondrial biogenesis. Pomegranate juice inhibits the expression of micro-RNA which is implicated in invasion and metastasis and the production of pro-inflammatory cytokines. The tumour inhibition was associated with increased expression of peroxisome proliferator-activated receptor gamma protein in the non-cancerous mucosa [21]. Pomegranate extract slows down the cell cycle and increases apoptosis, which may be accomplished by lowering the gene involved in androgen production.

Punica granatum extracts would cause mitochondrial fission in oral cancer cells, which would lead to cellular death. The high cytotoxic effect combined with apoptosis results in the anti-proliferative action against cancer cells. The reduction of the EMT pathway manifests the anticancer activity intended to prevent tumour migration and invasion.

Punicalagin, ellagic acid and pomegranate tannin have anti-tumour properties and can reduce the number of viable cells in human oral, prostate and colon tumours [22]. For instance, Peng et al. showed that after 24 hours of exposure to POMx, the epithelial marker levels were elevated in HSC-3 cell lines relative to control while EMT transcription factors and mesenchymal markers were downregulated [23].

CONCLUSION

Pomegranate consumption has grown as a result of its purported health advantages. The fruits which possess high polyphenol content have been reported to act as antioxidant and anti-carcinogenic [24]. Punica granatum extracts are an essential antioxidant nutraceutical food source that also has anti-proliferative and anti-invasion capabilities as well as the capacity to cause apoptosis in a variety of tumour cell lines, making them relevant from an anticancer standpoint. The preliminary data on the cellular lines of OSCC show that there are conditions for which Punica granatum extracts appear to be useful, at least from a standpoint of prevention, even though there are just preclinical in-vitro investigations. A large amount of information is emerging from accumulating research about the biological functions of pomegranate-derived compounds, notably about their anti-cancer potential [25].

The entire pomegranate fruit along with its juice and oil has been touted in studies as potential chemo-preventive or chemotherapeutic medicine because they exhibit anti-inflammatory, anti-proliferative and anti-tumorigenic actions via modifying various signalling pathways. The preliminary data on OSCC cell lines showed that there are conditions for which Punica granatum extracts appear to be useful, at least from a standpoint of prevention, even though there are just preclinical in-vitro investigations. To analyse the combinatorial effect of pomegranate with other agents, more in- vitro and in vivo research are required.

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Conflicts of interest

There are no conflicts of interest

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