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Glycoprotein Content of Duodenum in Induced Duodenal Ulcer in Aged Male Mice and Aloe Vera Gel

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Abstract: *The small intestine has the major contribution and significance in the assessment of drugs for its safety evaluation, because small intestine is first site of drug absorption. The structural change in mucosubstance and concentration of glycoprotein played prominent role in pathogenesis of gastrointestinal disorders [1] includes peptic ulcer, colitis and colon cancer[2]. In the present study we determined the Aloe vera gel exhibited antiulcer activity via restoring the decreased glycoprotein (Hexose, Fucose and sialic acid) level by its cell protective and cell regeneration mechanism in aged male mice. Aloe vera gel repairs the cellular function leads to improves the duodenal cell secretory activity of Cys- HCl induced ulcerated duodenum of aged male mice.*

Key words: *duodenal ulcer, glycoproteins, aging, male mice, Aloe vera*

I. INTRODUCTION

Peptic ulcer is prevalent, common disorder which affects lot of peoples all over the world. Different factors responsible for development gastric ulcer such as age, hormones, stress, smoking [3] alcohol, NSAIDS, spicy diet, chemicals and *H. pylori* [4]. Such factors forms imbalance between mucosal defensive (protective) factors such as mucosal blood flow, growth factors, ghrelin [5] and aggressive factors such as HCl, pepsin, bile secretion [6] develops peptic ulcer. Oxidative stress and aging both factors generates reactive oxygen species (ROS). Severity of ulcer formation were increased with advancing age because free radicals has been implicated in pathogenesis of ulcer. Today there are lots of synthetic drugs used for antiulcer and antioxidant treatment but they possess major adverse drug reaction. Which includes eliminating the *H. pylori* bacterium using antibiotics, various cytoprotective agents, Histamine₂ (H₂) receptor antagonists, antiseecretory proton pump inhibitors and use of acid neutralizing agents such as antacids (sodium bicarbonate, aluminum hydroxide, magnesium hydroxide) and/or acid blockers to relieve pain via neutralization of intraluminal acid [7] and promote healing of inflammatory injuries via inhibition of acid secretion [8,9] Some extent they not surely cure ulcer. Mucin has great importance in the gastrointestinal tract which is made up of specifically glycoproteins. Such mucus showed antioxidant activities in the gastrointestinal tract. Glycoprotein are the important component of cell membrane and cell organelles. Glycoprotein mucus secreted from the duodenal glands forms a continuous visco-elastic gel layer that always associated with the intestinal wall surface epithelium. Such viscous and elastic nature of mucin helps in the lubrication, formation of protective barrier to mucosal cells of the gastrointestinal tract [10]. The sialic acid, neutral substances such hexose, fucose and hexoamine are essential constituents of much glycoproteins [11]. Number of the reasons have been given by the various researchers regarding the increased use of medicinal plants against various gastrointestinal disease, disorders and therapies. They are more effective, superior than synthetic products due to the presence of active ingredients support to enhance biological activities. The *Aloe vera* is renowned medicinal plant for its potent curative activities [12]. Several researches reported that *Aloe vera* gel is rich in phyto-nutrients, the use of antioxidant rich diet lowers the risk of diseases at old age [13], though aloe gel was effectively employed for curing ulcer-induced inflammation in traditional Indian system of medicine; however, no efforts have been made against to curing a gastroduodenal ulcers in old people and animal using *Aloe vera* gel.

II. MATERIALS AND METHODS

A. Experimental Animal

In the present work, healthy Swiss strain albino old male mice (Old mice of 16 to 18 month age, weighing 45 ± 2 gm body weight) *Mus musculus* were used for the present in study. The breeding pairs were obtained from (Rajarambapu college of Pharmacy, Kasegaon, 209/CPCSEA). All animals were kept in air-conditioned departmental animal house. They were received Amrut mice feed (Pranav Agro Industries, Pvt. Ltd, Sangli) and water *ad libitum*. Body weight of control group and experimental group were recorded time to time.

B. Experimental Groups

Total 12 old male mice were divided into three groups containing four animals in each group:

- 1) *Control Group*: The old mice were given oral administration of 0.5 ml distilled water/ day/ animal for 15 days.
- 2) *Duodenal Ulcer Induced Group*: Mice were subcutaneous injected with Cysteamine – HCl (40mg/100gm/BW) dissolved in 0.5 ml distilled water [14].
- 3) *Cys - HCl +Aloe vera gel Treated Group*: Duodenal ulcer induced old male mice were given oral administration of *Aloe vera* gel 200 mg/kg dissolved in 0.5ml distilled water/ day/ mouse for 15 days [15].

After completion of the treatment control, cysteamine - HCl administered and *Aloe vera* gel treated mice were weighed and sacrificed by cervical dislocation. The duodenum were removed, weighed and were proceed for biochemical analysis of glycoproteins studies such as Hexose [16] , fucose [17] and Sialic acid [18].

C. Statistical Analysis

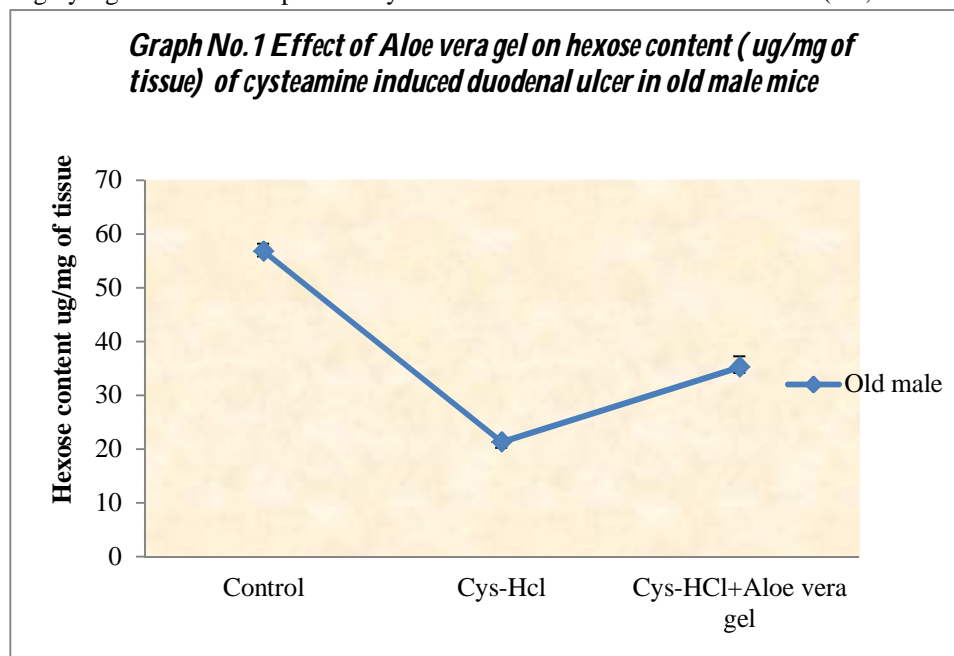
All values were expressed as mean \pm S.D. The statistical analysis was performed using student's 't' test. A value of $P < 0.001$ was considered statistically highly significant.

III. RESULT

A. Effect of aloe vera gel on the hexose content ($\mu\text{g}/\text{mg}$ tissue) in duodenum of cysteamine- hcl induced ulcer in old mice. (graph no.1)

The hexose content of control old male mice was 56.76 ± 1.453 which was reduced to 21.244 ± 0.9766 in cysteamine - HCl induced duodenal ulcer in old male mice. The decrease in the hexose content from duodenum of cysteamine - HCl induced ulcerated mice was highly significant as compared to hexose content of control group mice (1:2, $P < 0.001$).

Mice receiving *Aloe vera* gel were having hexose content 35.192 ± 2.087 . The increase in the hexose content in duodenum of *Aloe vera* gel treated mice was highly significant as compared to cysteamine - HCl induced ulcerated mice (2:3, $P < 0.001$).

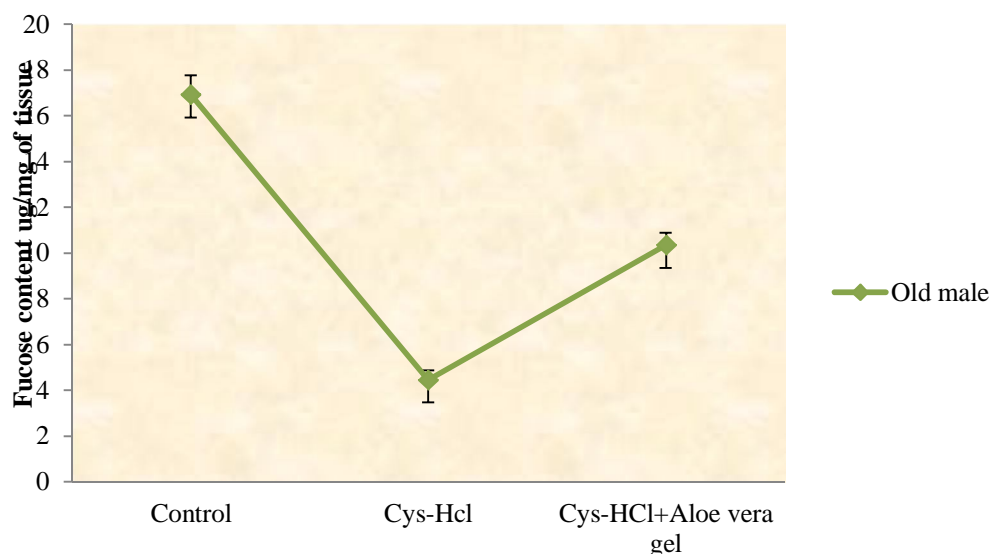


B. Effect of aloe vera gel on the fucose content ($\mu\text{g}/\text{mg}$ tissue) in duodenum of cysteamine- hcl induced ulcer in old male and female mice.(graph no. 2):

The fucose content of control old male mice was 16.93 ± 8.328 which was reduced to 4.466 ± 0.409 in cysteamine - HCl induced duodenal ulcer in old male mice. The decrease in the fucose content from duodenum of cysteamine - HCl induced ulcerated mice was highly significant as compared to fucose content of control group mice (1:2, $P < 0.001$).

Mice receiving *Aloe vera* gel were having fucose content 10.35 ± 0.5297 . The increase in the fucose content in duodenum of *Aloe vera* gel treated mice was highly significant as compared to cysteamine - HCl induced ulcerated mice (2:3, $P < 0.001$).

Graph No. 2 Effect of Aloe vera gel on fucose content (ug/mg of tissue) of cysteamine induced duodenal ulcer in old male mice

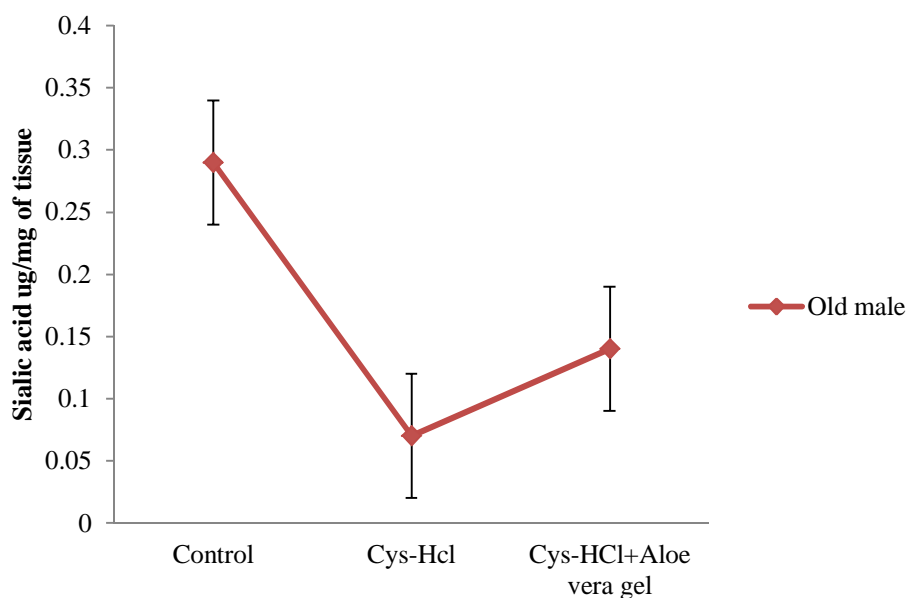


C. Effect of Aloe vera gel on the sialic acid content (ug/mg tissue) in duodenum of cysteamine- HCl induced ulcer in old mice.(Graph No.3):

The sialic acid content of control old male mice was 0.29 ± 0.0089 which was reduced to 0.07 ± 0.0083 in cysteamineHCl induced duodenal ulcer in old male mice. The decrease in the sialic acid content from duodenum of cysteamineHCl induced ulcerated mice was highly significant as compared to sialic acid content of control group mice (1:2, $P < 0.001$).

Mice receiving Aloe vera gel were having sialic acid content 0.14 ± 0.0083 . The increase in the sialic acid content in duodenum of Aloe vera gel treated mice was highly significant as compared to cysteamineHCl induced ulcerated mice (2:3, $P < 0.001$).

Graph No. 3 Effect of Aloe vera on sialic acid content (ug/mg of tissue) of cysteamine induced duodenal ulcer in old male mice



IV. DISCUSSION

Result of present work showed a decrease in the concentration of hexose, fucose and sialic acid in the Cys-HCl induced ulcerated group of male and female mice. Similar, results were also reported by [19] the glycoprotein synthesis activity of Brunners gland impaired by the Cys-HCl induced ulcer in rat. Our findings also consistent with mucus glycoprotein concentration depleted during ulceration it occurred might be due to degradation and altered mucosal glands structural integrity [20]. Mucosal layer of the upper small intestinal region reduced in *H.pyroli* ulceration [21]. Number of mucus producing cells (goblet cells) decreased results into lowered secretion of mucus over epithelial cells [22]. Decrease in mucosal surface epithelial cells function, unpaired mucus and bicarbonate secretory action prior to age [23] results into decreased absorption capacity [24] in the small intestine. The individual glycoprotein such as hexose, fucose and sialic acid all are significant constituents of mucins [25] and essential for maintenance of membrane structural integrity of mucosal cells of the duodenum [26].

Our results revealed that *Aloe vera* gel recovered the glycoprotein level near to the normal level (Graph 1,2 and 3). The *Aloe vera* gel may be involved in some extent to cure the lesions of mucosal area via suppressing the gastric acid secretion and helps to maintain normal mucosal integrity with its normal secretory activity. Our results were goes with findings [27, 28] who reported that several herbal extracts resembles antiulcer activity by protection of the mucosal barrier system promotes higher production of mucus, resulting in less degree of ulceration. The more secretion of mucus leading to higher in the mucin content helps to decreased acidic condition [25]. Mucus involved in the protection of mucosal and submucosal layer of the gastroduodenal region from inflammatory reaction. Mucosal defensive factors are prominently involved in the treatment of gastroduodenal ulcers. The mucosal layer of the gastrointestinal surface helps to protect the epithelial cell lining against hypersecretion of gastric acid [29], mucus coat contributes in the repairing of the mucosal epithelium [30]. Bicarbonate secretion of gastric and duodenal mucosal cells [31,32] maintain the normal gastrointestinal function but prior to stress disturbed function leads to decreased bicarbonate secretion. Mucus secretion is the significant factor involved in the defensive mechanism, helps in the protection of gastric wall from erosion [33]. The depleted level of hexose, fucose and sialic acid which was restored by *Aloe vera* gel by enhancing the mucosal defensive factors protects the duodenal mucosa from cytotoxic action of cys -HCl results into inhibition of ulcer formation [33]. Hence, it is observed that cytoprotective action of *Aloe vera* responsible for its antiulcer effect.

V. CONCLUSION

The present work proved that *Aloe vera* gel possess antiulcer activity that repairs duodenal cellular functions via restoring the glycoprotein level simultaneously enhance the antioxidant mechanism of old male mice.

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