Number of parietal cell in the gastric gland of gastric mucosa (body) and its relationship with different age group

Md. Muazzem Hossain[a], Humaira Naushaba[b], Nasrin jahan shammi[c], Uttam kumar Paul[d]

Abstract

Background: The stomach is the most dilated part of the alimentary tract. It is concerned with a number of diseases like gastritis, peptic ulcer along with its complications like perforation, haemorrhage, gastric outlet obstruction and cancer. In many of this disorder, the treatment procedures include surgical interventions of stomach. A massive knowledge of the perfect histomorphology of stomach carries great importance in the medical and surgical treatment of various stomach-related diseases. The most conspicuous cells of the gastric mucosa are the parietal cells. These are the source of hydrochloric acid and intrinsic factor of gastric juice. **Objective:** To find out the number of parietal cell mass of the gastric gland in the gastric mucosa of the stomach and its association with age. **Methods:** This descriptive type of study was conducted in the department of Anatomy, Sir Salimullah Medical College (SSMC), Dhaka from July 2005 to June 2006. Sixty (60) human postmortem stomach were included in this study, age ranging from 0 to70 years. The samples were collected from apparently fresh unclaimed dead bodies within 24 to36 hours of death before showing any signs of decomposition from the morgue of Sir Salimullah Medical College (SSMC) and Dhaka Medical College (DMC), Dhaka.The collected samples were divided into three (3) different age groups: A= 0-14years, B=15-22 years and C=23 years and above . Unpaired "t" test was applied to test the differences of mean parietal cell among the different age groups **Results:** The mean (±SD) number of parietal cell in group A (0-14 years), B (15-22 years) and C (23 years and above) were 1355.76±52.84, 1420.29±48.32 and 1426.08±114.48 cells/mm^2 respectively. The mean numbers of parietal cell increased with age but the differences were not significant (P>0.05, >0.10 and>0.50). **Conclusion**: The number of parietal cells showed significant positive correlation with age but had no significant difference among` different age groups.

Key word: Parietal cell, stomach, gastric gland.

[a]Professor, Department of Anatomy, Kumudini Women's Medical Medical College, Mirzapur, Tangail, Banglsadesh.

[b]Professor, Department of Anatomy, Dhaka Medical College, Dhaka, Banglsadesh.

[c]Associate Professor, Department of Pharmacology and Therapeutics, Barind Medical College, Rajshahi, Bangladesh.

[d]Professor, Department of Anatomy, Sir Salimullah Medical College, Dhaka, Banglsadesh.

Correspondence to : MM Hossain

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Introduction

The stomach (ventriculus or referably gaster) is the most dilated part of the alimentary tract that is continuous with the oesophagus proximally and the duodenum distally. Anatomically, the stomach is divided into cardia, fundus, body or corpus, and pylorus .[1]

The fundus and body have identical histological structure, so the stomach has only three histologically distinct regions.[2] The stomach consists of four layers. The inner mucosa contains different types of glands. Gastric glands comprise cardiac , body fundus (fundic glands) and pyloric glands.[1]

The parietal cell, one of the important cells of the gastric glands, secrete hydrochloric acid and intrinsic factor which is necessary for the reabsorption of vitamin B_{12}. Parietal

cells are scattered along the gastric gland and occupy much space due to their large size. In gastric mucosal tissue sections, the parietal cell comprises 12% of all epithelial cells in humans. [3]

The normal stomach contains approximately one billion parietal cells.[4]The quantity of acid produced by the stomach is related to the parietal cell mass, and peptic ulcer patients generally have a larger parietal cell mass than normal persons.[5] The number of parietal cells tend to increase with age making the elderly people more susceptible to gastric mucosa damage.[6] In human subjects, a significant decrease in parietal cell mass index in males over 60 years has been recorded.[7]A decrease in the large acid secretory areas have been found over the age of 60 years .[8]

Material and Method

The present study was performed on sixty (60) postmortem stomachs of Bangladeshi people of different age groups. The viscera were collected from apparently fresh unclaimed dead bodies autopsied in the morgue of the department of Forensic Medicine, Sir Salimullah Medical College (SSMC) and Dhaka Medical College (DMC), Dhaka after requisite legal formalities. The samples were collected within 24 to 36 hours of death before showing any signs of decomposition. Each specimen was tagged properly with an identification number. The age, sex and cause of death were noted down in a separate register book from the morgue's record book.

After bringing to the dissection room, the samples were washed thoroughly with running tap water. Fat and other unwanted tissue were removed from the stomach. Then the samples were kept in 10% formol saline solution for preservation and fixation. The collected samples were divided into 3 groups. Group A (0-14years), group B (15-22years) and group C (23 years and above).

Table 1: Age distribution of different study groups

Group	Age in years	Number of sample	Percentage %
A	0-14	7	11.7
B	15-22	17	28.3
C	23 and above	36	60.0

Procedure of histological study:

a. Preparation of histological slide: Eighteen relatively fresh samples (6 stomachs each from three age groups) were selected to determine the number of parietal cells/sqmm area of stomach mucosa. For histological study, tissues measuring approximately 1cmx1cmxwhole thickness were taken from anterior wall of the stomach.

By standard histological procedure, the tissue blocks were made and 6µm thick paraffin sections were prepared. The better sections were then taken on albuminized slides and dried in air. Six slides from the body of the stomach from each study group were prepared for the study. Thus, a total of 6x3=18 histological slides were made. Staining of the histological section was done by Hematoxylin and Eosin.

Parameter studied

The number of parietal cell/ sqmm area of stomach mucosa.

b. Procedure of measurement of the number of parietal cell:

The tissue sections on the slides were

divided into three equal parts by drawing transverse lines with fine marker pens on the cover slips at right angle to the long axis of the section.[9] From each division, one microscopic field from apparently maximal mucosal folding area was chosen keeping equal distance between the inner and outer border of the mucosa. Because of the small size of the parietal cells, the slide were viewed in high magnification (X 40 objectives). Thus, 18 fields were examined from 6 slides of body region from each study group. The counting was done within a counting circle specially devised to count the parietal cells.

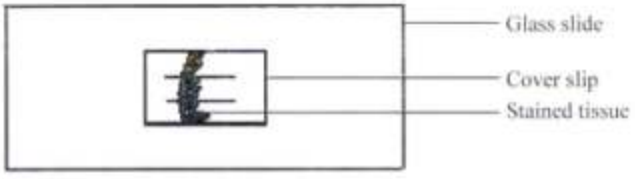

Figure 1: Three equal divisions of the tissue section.

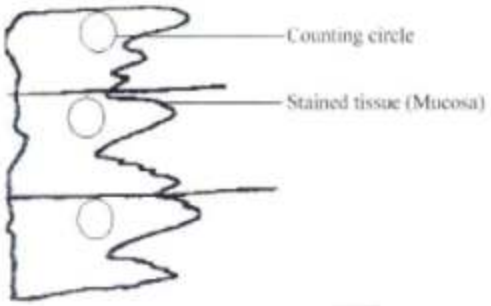

Figure 2: Showing the microscopic fields for counting parietal cell number.

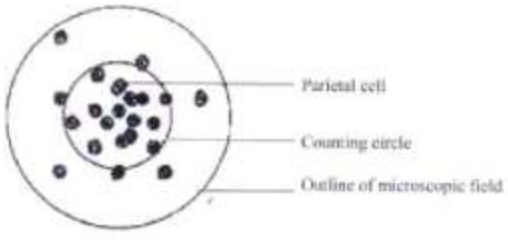

Figure 3: Counting circle

The circle was 5 mm in diameter printed on a transparent plastic sheet, which was cut to fit into eyepiece, thus a black circular outline was superimposed over the actual microscopic field. The intact parietal cells within the counting circle were counted. Average count was calculated from three different fields of each slide. Six average counts were available for the body from each age group. The count was then converted into numbers per square millimeter (mm^2) by a stage micrometer.

The inner diameter of the counting circle corresponded with 11divisions of stage micrometer under an X40 objective and an X10 eyepiece, that is,

11 divisions of stage micrometer=110μm

[Because, one smallest division of stage micrometer equal to 10 micrometer]

Therefore, radius of the circle=110÷2=55μm

Therefore, area of the circle

$=r^2$

$=3.1416 \times [55\mu m]^2$

$=3.1416 \times 55\mu m \times 55\mu m$

$=3.1416 \times 3025\ \mu m^2$

$=9503.34\ \mu m^2$

It is known that $1mm^2=1000 \times 1000\ \mu m^2=1000{,}000\ \mu m^2$

If it is thought that the number of cells counted within the circle is n, then 9503.34 μm^2 contains n number of cells

Therefore, 1 μm^2contains

$n \div 9503.34$ cells

Therefore,

1,000,000 μm^2 contains

$[n \div 9503.34]$ 1,000,000 cells

$= [n \times 1{,}000{,}000] \div 9503.34$ cells

$= nx105.22$ number of cells

Therefore, N=nx105.22

Where, N= Number of cells per mm² area of the microscopic field
n= Average number of cells counted within the circle (9503.34μm²)

Unpaired t test was applied to test the differences of mean parietal cell among the different age groups.

Results

The mean (±SD) number of parietal cell in group A (0-14 years), B (15-22 years) and C (23 years and above) were 1355.76±52.84, 1420.29±48.32 and 1426.08±114.48 cells/mm² respectively. The mean number of parietal cell was highest in group C (1426.08) and lowest in group A (1355.76). The number of parietal cell increase with age but the differences in the number of parietal cell of the body of the stomach in all age groups (A, B and C) did not reach up to significant level (P>0.05, >0.10 and >0.50).

Table 2: Parietal cells in the histological section of the body of the stomach in different study groups

Group	n	Parietal cell/mm² Mean±SD
A	6	1355.76±52.84 (1297.36-1402.58)
B	6	1420.29±48.32 (1367.86-1473.08)
C	6	1426.08±114.48 (1262.64-1613.02)
		P value
A vs B		$>0.05^{ns}$
A vs C		$>0.10^{ns}$
B vs C		$>0.50^{ns}$

Note: Figures in parentheses indicate range. Statistical analyses were done by Unpaired Student's 't' test, ns = Not significant.

Group A : Age 0-14 years
Group B : Age 15-22 years
Group C : Age 23 years and above

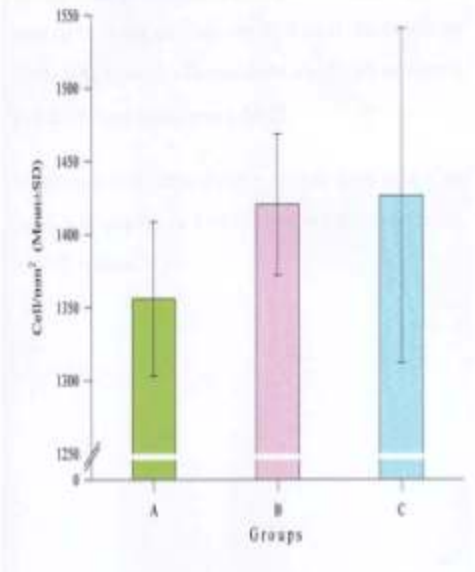

Figure 4: Parietal cell in the histological section of the body of the stomach in different study groups

Group A : Age 0-14 years
Group B : Age 15-22 years
Group C : Age 23 years and above

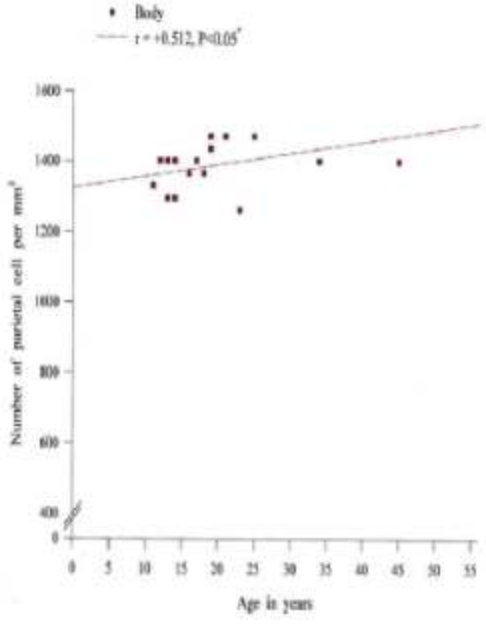

Figure 5: Relationship between age and number of parietal cell in body of the stomach

Discussion

The parietal cells are found in high abundance in the gastric gland and the capacity of the stomach to secret hydrochloric acid is almost linearly related to parietal cell numbers. The number of parietal cell/sq.mm area of microscopic field were counted in the body region of the stomach in the present study.

The mean (±SD) number of parietal cell per square millimeter was highest (1426.08±114.48) in group C and lowest (1355.76±52.84) in group A. The differences of values were not significant (P>0.05, >0.10 and >0.50) when group A was compared with group B and C. The findings were slightly higher than that of Berger.[10]

Age showed positive relationship with number of parietal cell in body (r = +0.512) region which is significant (P<0.05).The findings of this is in agreement with that of Farinnati.[6]

Parietal cells bear receptors for stimulators like Acetylcholine, gastrin, histamine which are reflecting a triumvirate of neural, paracrine and endocrine control.[11] However, parietal cells volume in gastric gland should be dermined appropriately and further studies are also required.

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