

UDC: 613.2:614.31:616.3

**HYGIENIC ASSESSMENT OF FOOD SAFETY AND ITS RELATIONSHIP WITH  
GASTROINTESTINAL DISEASE PATTERNS**

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**Abstract:** Background: Foodborne diseases represent a significant public health burden globally. This study aims to conduct a hygienic assessment of food products sold in various retail outlets (open markets vs. supermarkets) and analyze the correlation between food contamination levels and the prevalence of gastrointestinal (GI) diseases in the local population. Methods: A cross-sectional study was conducted involving the microbiological and chemical analysis of 500 food samples (meat, dairy, fresh produce). Concurrently, epidemiological data on acute gastrointestinal infections and chronic gastritis were analyzed for the same period. Results: Microbiological non-compliance was significantly higher in open markets (28.5%) compared to supermarkets (8.2%). A strong positive correlation ( $r = 0.78$ ) was found between the seasonal peak of coliform contamination in dairy products and hospital admissions for acute gastroenteritis. Conclusion: The study confirms that violations of sanitary-hygienic norms in food storage and sales are direct drivers of GI morbidity. Strengthening sanitary control mechanisms and public hygiene education are essential for disease prevention.

**Keywords:** Food safety, food hygiene, gastrointestinal diseases, microbiological contamination, Salmonella, E. coli, sanitary assessment.

**OZIQ-OVQAT XAVFSIZLIGINI GIGIYENIK BAHOLASH VA UNING OSHQOZON-  
ICHAK KASALLIKLARI BILAN BOG'LIQLIGI**

**Annotatsiya:** Kirish: Oziq-ovqatdan kelib chiqadigan kasalliklar global miqyosda jamoat salomatligi uchun jiddiy yuk hisoblanadi. Ushbu tadqiqot turli savdo shoxobchalarida (ochiq bozorlar va supermarketlar) sotiladigan oziq-ovqat mahsulotlarini gigiyenik baholash va oziq-ovqat ifloslanishi darajasining mahalliy aholi orasida oshqozon-ichak kasalliklari tarqalishi bilan bog'liqligini tahlil qilishni maqsad qilgan. Usullar: 500 ta oziq-ovqat namunasini (go'sht, sut, ho'l mevalar) mikrobiologik va kimyoviy tahlil qilishni o'z ichiga olgan ko'ndalang (cross-sectional) tadqiqot o'tkazildi. Shu bilan birga, ayni shu davr uchun o'tkir oshqozon-ichak infeksiyalari va surunkali gastrit bo'yicha epidemiologik ma'lumotlar tahlil qilindi. Natijalar: Mikrobiologik nomuvofiqlik ochiq bozorlarda (28.5%) supermarketlarga (8.2%) qaraganda sezilarli darajada yuqori ekanligi aniqlandi. Sut mahsulotlarida ichak tayoqchasi guruhi bakteriyalari bilan ifloslanishning mavsumiy cho'qqisi va o'tkir gastroenterit bilan shifoxonaga yotqizishlar o'rtasida kuchli musbat korrelyatsiya ( $r = 0.78$ ) topildi. Xulosa: Tadqiqot oziq-ovqatni saqlash va sotishda sanitariya-gigiyena normalarining buzilishi oshqozon-ichak kasalliklarining bevosita sababchisi ekanligini tasdiqlaydi. Kasallikning oldini olish uchun sanitariya nazorati mexanizmlarini kuchaytirish va aholining gigiyenik savodxonligini oshirish zarur.

**Kalit so'zlar:** Oziq-ovqat xavfsizligi, ovqatlanish gigiyenasi, oshqozon-ichak kasalliklari, mikrobiologik ifloslanish, Salmonella, E. coli, sanitariya baholash.

**ГИГИЕНИЧЕСКАЯ ОЦЕНКА БЕЗОПАСНОСТИ ПИЩЕВЫХ ПРОДУКТОВ И ЕЕ  
ВЗАИМОСВЯЗЬ СО СТРУКТУРОЙ ЖЕЛУДОЧНО-КИШЕЧНЫХ ЗАБОЛЕВАНИЙ**

**Аннотация:** Введение: Болезни пищевого происхождения представляют собой значительное бремя для общественного здравоохранения во всем мире. Целью данного исследования является гигиеническая оценка продуктов питания, реализуемых в различных торговых точках (открытые рынки и супермаркеты), и анализ корреляции между уровнем загрязнения продуктов и распространенностью желудочно-кишечных заболеваний (ЖКТ) среди местного населения. Методы: Было проведено перекрестное исследование, включающее микробиологический и химический анализ 500 проб пищевых продуктов (мясо, молочные продукты, свежие продукты). Одновременно были проанализированы эпидемиологические данные по острым кишечным инфекциям и хроническому гастриту за тот же период. Результаты: Микробиологическое несоответствие было значительно выше на открытых рынках (28,5%) по сравнению с супермаркетами (8,2%). Обнаружена сильная положительная корреляция ( $r = 0,78$ ) между сезонным пиком загрязнения молочных продуктов бактериями группы кишечной палочки и госпитализацией с острым гастроэнтеритом. Заключение: Исследование подтверждает, что нарушения санитарно-гигиенических норм при хранении и реализации продуктов питания являются прямыми факторами заболеваемости ЖКТ. Усиление механизмов санитарного контроля и санитарное просвещение населения имеют важное значение для профилактики заболеваний.

**Ключевые слова:** Пищевая безопасность, гигиена питания, желудочно-кишечные заболевания, микробиологическое загрязнение, Salmonella, E. coli, санитарная оценка.

## INTRODUCTION

Food safety is a fundamental requirement for public health and a key determinant of the quality of life. Access to safe, nutritious, and sufficient food is a basic human right; however, foodborne illnesses remain a persistent challenge globally. The World Health Organization (WHO) estimates that almost 1 in 10 people in the world fall ill after eating contaminated food every year, resulting in 420,000 deaths. In developing regions, the issue is exacerbated by rapid urbanization, inadequate infrastructure for food storage (cold chain systems), and informal food markets.

Gastrointestinal (GI) diseases, ranging from acute infectious diarrhea to chronic conditions like gastritis and helminthiasis, are the most direct clinical consequence of consuming unsafe food. Factors such as microbial contamination (bacteria, viruses, parasites) and chemical hazards (pesticides, nitrates, heavy metals) play a pivotal role in the etiology of these diseases.

In many regions, traditional open-air markets ("bazaars") coexist with modern supermarkets. While markets provide access to fresh local produce, they often lack rigorous sanitary oversight compared to organized retail chains. This study aims to provide a comparative hygienic assessment of food safety in these two types of retail outlets and specifically quantify the relationship between detected food safety violations and the incidence of gastrointestinal diseases in the served population.

## LITERATURE REVIEW

Microbial Contamination Vectors - Microbial pathogens are the leading cause of foodborne GI diseases. Extensive literature identifies Salmonella spp., Campylobacter, and pathogenic Escherichia coli (E. coli) as the primary culprits. A study by Havelaar et al. (2015) highlighted that biological hazards are responsible for the majority of the global burden of foodborne disease. In dairy products, particularly unpasteurized milk sold in informal markets, the presence of

Staphylococcus aureus and coliforms is frequently cited as a major risk factor for acute gastroenteritis.

**Chemical Contaminants and Chronic GI Health** - While microbes cause acute outbreaks, chemical contaminants are linked to chronic GI issues. Nitrates in early-season vegetables and melons can convert to nitrites in the body, causing methemoglobinemia and irritating the gastric mucosa, potentially contributing to chronic gastritis (Mensinga et al., 2003). Furthermore, pesticide residues on unwashed produce have been linked to long-term disruption of the gut microbiome and intestinal inflammation.

**Retail Hygiene and Environmental Factors** - The environment in which food is sold significantly impacts its safety. Research indicates that foods sold in open-air markets are more susceptible to environmental pollutants (dust, vehicle exhaust) and vector-borne contamination (flies, rodents) compared to supermarkets with controlled HVAC systems. However, consumer perception often equates "freshness" with open markets, ignoring the hygienic risks. Previous studies have correlated seasonal increases in temperature with bacterial proliferation in meat and dairy products, leading to summer peaks in food poisoning cases.

### MATERIALS AND METHODS

**Study Design** - A cross-sectional analytical study was conducted over a 12-month period. The study area included two distinct districts: District A (predominantly served by open-air markets) and District B (predominantly served by modern supermarkets).

**Sampling and Laboratory Analysis** A total of 500 food samples were collected randomly: 1) Categories - Raw meat (beef/mutton), Dairy (milk/cottage cheese), and Fresh Produce (leafy greens/melons). 2) Locations - 250 samples from open markets and 250 from supermarkets.

**Analysis** - Samples were transported in sterile cold boxes to the sanitary-hygienic laboratory.

**Microbiological** - Tested for Total Plate Count (TPC), Coliforms, Salmonella, and Staphylococcus aureus.

**Chemical** - Tested for Nitrates (greiss method) and pesticide residues.

**Epidemiological data** - Anonymized health data regarding hospital admissions and outpatient visits for "Acute Gastroenteritis of Presumed Infectious Origin" (ICD-10: A09) and "Gastritis/Duodenitis" (ICD-10: K29) were obtained from local polyclinics for the same timeline.

**Statistical analysis** - Data were analyzed using standard statistical software. The Chi-square test was used to compare non-compliance rates between markets and supermarkets. Pearson correlation coefficients were calculated to assess the relationship between monthly food contamination rates and GI disease incidence.

### RESULTS

**Hygienic Assessment of Food Products** - The laboratory analysis revealed a significant disparity in food safety standards between the two retail types. As shown in Table 1, open markets had a much higher rate of sanitary violations.

**Table 1: Percentage of Food Samples Non-Compliant with Sanitary Norms**

Food Category	Contaminant Type	Open Markets (%)	Supermarkets (%)	P-value
<b>Dairy Products</b>	Coliforms / E. coli	34.2%	4.5%	<0.001
<b>Raw Meat</b>	Salmonella spp.	12.8%	1.2%	<0.01
<b>Fresh Produce</b>	Nitrates (Excess)	18.4%	11.6%	0.04
<b>Prepared Salads</b>	Staph. aureus	22.1%	5.3%	<0.001
<b>Total Average</b>	All Indicators	28.5%	8.2%	<0.001

Gastrointestinal disease incidence - The epidemiological analysis showed that the incidence of acute GI infections was 45% higher in District A (Market-dependent) compared to District B.

**Table 2: Seasonal Correlation Between Dairy Contamination and Acute Gastroenteritis**

Season	Avg. Temp (°C)	Dairy Contamination Rate (Markets)	Acute GI Cases (per 10,000 pop.)
Winter	4.2	12.0%	15.4
Spring	18.5	22.5%	28.1
Summer	32.4	48.6%	62.3
Autumn	15.6	18.2%	21.5

Correlation findings - There was a strong positive correlation ( $r=0.78$ ,  $p<0.01$ ) between the bacterial contamination rates of dairy products and the monthly incidence of acute gastroenteritis. Additionally, a moderate correlation ( $r=0.55$ ) was observed between nitrate levels in early spring vegetables and complaints of acute gastritis/dyspepsia.

### DISCUSSION

The findings of this hygienic assessment highlight a critical gap in food safety infrastructure in traditional retail settings. The high prevalence of coliform bacteria in dairy products sold in open markets (34.2%) points to failures in the cold chain and poor personal hygiene of vendors. Unlike supermarkets, where refrigeration is mandatory and monitored, open market vendors often display perishable goods at ambient temperatures, promoting rapid bacterial growth, especially during the summer months (as evidenced in Table 2).

The correlation between these hygienic violations and GI morbidity is undeniable. The "Summer Peak" of gastroenteritis directly mirrors the spike in microbial non-compliance. This suggests that a significant portion of the summer burden of disease is preventable through better food handling.

Regarding chemical safety, the higher nitrate levels in market produce may be due to the lack of rigorous incoming quality control that large supermarket chains typically enforce. This chronic exposure to chemical irritants likely contributes to the higher background rates of gastritis observed in the population relying on these markets.

### CONCLUSION

The study provides robust evidence that the hygienic condition of food sales outlets is a primary determinant of gastrointestinal health in the community.

Open-air markets pose a significantly higher health risk (3.5 times higher non-compliance rate) compared to supermarkets due to inadequate refrigeration and sanitation.

There is a strong statistical relationship between microbiological food contamination and the incidence of acute gastrointestinal infections.

The interaction between high ambient temperatures and poor storage infrastructure creates a critical window of vulnerability in the summer months.

### RECOMMENDATIONS

Implementation of stricter sanitary audits for open markets, specifically targeting the cold storage of dairy and meat products.

Municipal investment in providing electrical points and refrigeration units for market stalls.

Launching awareness campaigns on the dangers of purchasing unpasteurized milk and washing produce to remove chemical residues.

Routine monitoring of nitrate levels in seasonal vegetables before they reach the consumer market.

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