

# Street food consumption as a risk factor for symptoms of dyspepsia in medical students

Christian R. Mejia,<sup>1\*</sup>  Brighth Cruz,<sup>2</sup>  Mariela Vargas,<sup>3</sup>  Araseli Verástegui-Díaz.<sup>3</sup> 

## OPEN ACCESS

### Citation:

Mejia CR, Cruz B, Vargas M, Verástegui-Díaz A. Street food consumption as a risk factor for symptoms of dyspepsia in medical students. *Rev Colomb Gastroenterol.* 2021;36(3):322-326. <https://doi.org/10.22516/25007440.653>

<sup>1</sup> College of Human Medicine, Universidad Continental. Huancayo, Peru.

<sup>2</sup> Medical Association for Health Research and Services. Lima, Peru.

<sup>3</sup> Faculty of Medicine, Universidad Ricardo Palma. Lima, Peru.

\*Correspondence: Christian R. Mejia.  
[christian.mejia.md@gmail.com](mailto:christian.mejia.md@gmail.com)

Received: 03/09/20

Accepted: 03/05/21



## Abstract

**Introduction:** University students often eat at street food stalls, which can cause various digestive symptoms, although this has not been evidenced in studies carried out in this population. **Objective:** To establish whether food consumption in street food stalls is associated with symptoms of dyspepsia in Peruvian medical students. **Materials and methods:** A secondary data analysis of a multicenter study was conducted. Of 1 797 medical students surveyed in eight medical schools, a statistical power of 93% was calculated. Symptoms of dyspepsia were associated with a history of food consumption in street food stalls. Association statistics were obtained with bivariate and multivariate models. **Results:** The prevalence of functional dyspepsia varied between 9-28% and food consumption in street stalls between 1-5%. In the multivariate analysis, eating food in the street was a factor associated with a greater frequency of suffering from functional dyspepsia (aPR: 1.45; 95%CI: 1.09-1.94; p=0.010). In addition, other significant variables were the female sex (aPR: 1.40; 95%CI: 1.15-1.71 p=0.001) and people eating at similar times (aPR: 0.76; 95%CI: 0.61-0.94; p=0.012) adjusted for age, and academic term. **Conclusions:** Dyspepsia symptoms were more common in students who ate their food from street stalls. This should be monitored by health and university authorities, as it can have short- and long-term consequences.

## Keywords

Functional dyspepsia; Medical students; Peru. (Source: DeCS)

## INTRODUCTION

Gastric diseases continue to be among the main causes of acute and chronic illnesses of the general population<sup>(1)</sup>. Several studies that evaluate the factors that influence their appearance have shown that the quality of food is a transcendental factor, which along with other related factors promote the development of gastrointestinal diseases<sup>(2,3)</sup>, especially in Latin American countries (such as Peru), where the preparation hygiene, conservation and sale of food is still deficient<sup>(4)</sup>, situation that increases the risk of acquiring infectious and parasitic gastrointestinal tract diseases<sup>(5-7)</sup>.

This situation becomes more important in populations such as university students, who due to the limited time they have, scarce economic resources and little care for their individual health, seek to acquire these foods in the simplest and fastest way, which exposes them to a greater risk of acquiring gastrointestinal infectious diseases. Recent studies show that between 24% and 46% of medical students in Latin American countries suffered from functional dyspepsia, associated with various social and educational factors among other habits<sup>(4)</sup>. But these studies did not focus on how students get their food. Therefore, the objective of this research was to determine if the consumption of food sold by street

vendors is associated with dyspeptic symptoms in Peruvian medical students.

## MATERIAL AND METHODS

A multicenter study of secondary data analysis was conducted, which was based on a sample obtained from the primary study carried out in 2016 for the determination of factors that were associated with functional dyspepsia among medical students<sup>(4)</sup>. The main study included a survey for medical students and the data of those students who satisfactorily answered the questions to determine if they suffered from dyspepsia and the place where they ate their food. One student was excluded for having been diagnosed with organic dyspepsia, three for having had peptic ulcer, six for gastroesophageal reflux disease and 116 for being diagnosed with gastritis. The final population was 1797 students from seven departments of Peru: 400 from Lima, 539 from Piura, 220 from Cajamarca, 277 from Huancayo, 109 from Cusco, 101 from Ica and 151 from Ucayali.

The variable that showed the suffering of dyspeptic symptoms was measured by a validated test in the Peruvian population in which it was asked about the condition of symptomatology in nine scenarios: easy feeling of fullness (the feeling of being full before the usual), postprandial epigastric fullness (the feeling of being full after eating less than usual), heartburn (the burning sensation that rises from the stomach to the pharynx), regurgitation (the effortless return of food contents through the esophagus), nausea (feeling like vomiting), vomiting (the violent and spasmodic expulsion of stomach contents through the mouth), postprandial epigastric pain (the annoying sensation in the epigastrium continuously or intermittently after eating food), excessive belching (the expulsion of excess air from the upper digestive tract that exceeds normality) and hunger pain (the feeling of stomach emptiness, essentially in the abdomen). Those with three or more symptoms with moderate or very frequent intensity were considered positive, the test used for this had 95% sensitivity and 100% specificity<sup>(8)</sup>. The primary independent variable was where they regularly ate their food, and the category of interest was whether they did it at street vending sites. In addition, the adjustment variables were considered: sex (male/female), age (taken quantitatively for descriptive and analytical statistics), study semester (taken quantitatively for descriptive and analytical statistics) and eating at similar times (yes/no).

After acquiring the database for secondary analysis, the data was filtered with the selection criteria, which was carried out in the Microsoft Excel 2010 program (Windows version). Finally, the data was transferred to the Stata 11.1

program (Stata Corp LP, College Station, TX, United States); in which all statistical analyses were performed.

For the descriptive analysis, the qualitative variables were analyzed with their frequencies and percentages. The quantitative variables were described with the median and interquartile range (IQR), after confirmation of their non-normality with the Shapiro-Wilk test. For analytical statistics, the chi-square test was used for the crossing of two qualitative variables and the sum of ranges for the crossing of a qualitative versus a quantitative one. Finally, an analysis was developed using generalized linear models using the *Poisson* family, the log link function and robust models, and the host university was considered as a cluster group (to take into account the individuality of each population evaluated); with this, the crude prevalence ratios (cPR) and adjusted (aPR) were obtained with their 95% confidence intervals (95% CI) and *p* values. The *p* < 0.05 values were considered statistically significant.

## RESULTS

Of the 1797 medical students, 53% (960) were women, the median age was 20 years-old (IQR: 18-22 years old). 3% (52) said they ate regularly at street vending sites and 23% (412) had a positive diagnosis for dyspepsia. When describing the population according to their eating in street vending sites, similarities were found in sex, ages and semesters frequencies; however, there were differences according to eating at similar times (*p* = 0.021) (**Table 1**).

**Table 1.** Characteristics of medical students according to food consumption on street vending sites

Variables	Eating in Street Vending Sites n (%)		p Value
	Yes	No	
Sex			
- Female	25 (48.1)	929 (53.5)	0.441
- Male	27 (51.9)	808 (46.5)	
Age (years)	20 (19-23)	20 (18-22)	0.105
Semester*	4 (3-7.5)	5 (2-8)	0.655
Eating at Similar Times			
- Yes	20 (38.5)	782 (45.4)	0.021
- No	32 (61.5)	941 (54.6)	

\*Median and IQR. *p* values obtained with the chi-square test for the crossing of two qualitative variables and the sum of ranges for the crossing of a qualitative versus a quantitative one.

**Figure 1** shows that the range of functional dyspepsia varied between 9% and 28%, and that of food consumption in street vending sites, between 1% and 5%.

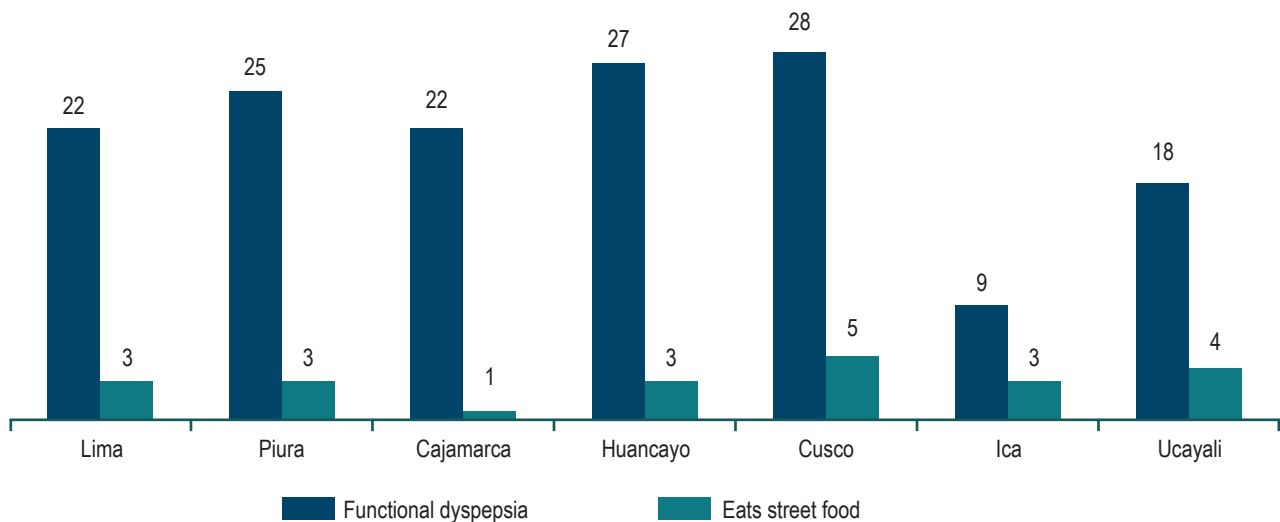
**Figure 2** shows that the percentages of food consumption were similar according to whether they had (4%) dyspepsia or not (3%), and this was statistically similar.

In the multivariate analysis, eating food in the street was a factor associated with the greater frequency of suffering from functional dyspepsia (aPR: 1.45; 95% CI: 1.09-1.94;  $p = 0,010$ ). In addition, other variables that were significant were the female sex (aPR: 1,40; CI 95 %: 1,15-1,71;  $p =$

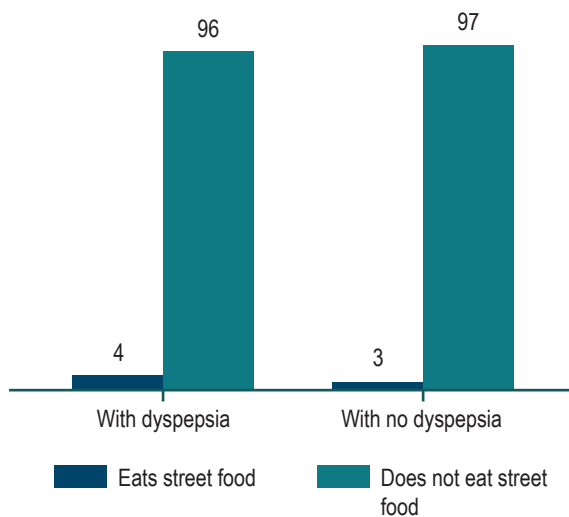
0,001) and people eating at similar times (aPR: -0.76; 95% CI: 0,61-0,94;  $p = 0,012$ ) all adjusted by age, and academic term (**Table 2**).

## DISCUSSION

It was found that a small percentage of medical students eat regularly at street vending sites, but this was a factor associated with functional dyspepsia; although no studies were found on the possible association, Barker et al. identified the risk of suffering from gastrointestinal diseases and



**Figure 1.** Percentage of functional dyspepsia and food consumption at street vending sites in medical students from seven departments of Peru.



**Figure 2.** Functional dyspepsia and food consumption at street vending sites in medical students from seven departments of Peru.

**Table 2.** Bivariate and multivariate analysis of functional dyspepsia on an empty stomach.

Functional Dyspepsia	Bivariate		Multivariate	
	cPR (CI 95 %)	p Value	aPR (95% CI)	p Value
Eating in Street Vending Sites n (%)	1.45 (1.03-2.04)	0.033	1.45 (1.09-1.94)	0.010
Women	1.43 (1.15-1.78)	0.001	1.40 (1.15-1.71)	0.001
Age (years)	0.97 (0.93-1.02)	0.256	0.98 (0.95-1.02)	0.395
Semester*	0.98 (0.93-1.02)	0.323	0.99 (0.96-1.03)	0.590
Eating at Similar Times	0.76 (0.65-0.91)	0.002	0.76 (0.61-0.94)	0.012

cPR, aPR, 95% CI and p-values obtained with generalized linear models, using the *Poisson* family, log link function, robust models and considering the host university as a cluster group. \*Taken as quantitative variables.

the consumption of food dispensed by street vendors<sup>(9)</sup>, possibly because the foods traded in these establishments have many health issues as it has been reported in various international studies, where unacceptable values of microbiological contaminants are identified<sup>(10-13)</sup>.

Women had a positive association with functional dyspepsia, and this was reported by local<sup>(4,14,15)</sup> and international research, in which they identified the association between dyspeptic symptomatology and sex ( $p$  Value = 0.001)<sup>(16,17)</sup>.

Finally, having similar schedules for feeding was a factor negatively associated with functional dyspepsia. This has been reported by some studies<sup>(9)</sup>, but in others no such association was found<sup>(16)</sup>. However, this relationship has

not been much investigated in other realities, which may be a point to consider in future investigations.

There was a limitation in the results obtained, since they reflect the reality of only seven departments of Peru, but not of all medical students in Peru; however, the results are valid because this reality is reflected in seven of the most important cities in the country. Lastly, the statistical power was sufficient to determine the proposed association.

It is concluded that those who consume their food in street vending sites have a positive association with the condition of functional dyspepsia; In addition, other influential variables in this relationship are the female sex and that medical students consume their food at similar times.

## REFERENCES

1. Godínez-Oviedo A. Prevalencia y causas de enfermedades gastrointestinales en niños del estado de Hidalgo, México. *Salud Pública México*. 2017;59(2):118-9. <https://doi.org/10.21149/8064>
2. Falcón MR, Barrón JM, Romero AL, Domínguez MF. Efecto adverso en la calidad proteica de los alimentos de dietas con alto contenido de fibra dietaria. *Rev Chil Nutr*. 2011;38(3):369-75. <https://doi.org/10.4067/S0717-75182011000300012>
3. Alejo Z, Rodríguez Fuente A, López Sosa D, Almaguer Sabina P. Patrón alimentario en adolescentes de octavo grado y su repercusión en la adecuación dietética. *Medisur*. 2011;9(6):518-22.
4. Vargas M, Talledo-Ulfe L, Samaniego RO, Heredia P, Rodríguez CA, Mogollón CA, Enríquez WF, Mejía CR. Dispepsia funcional en estudiantes de ocho facultades de medicina peruanas. Influencia de los hábitos. *Acta Gastroenterológica Latinoam*. 2016;46(2):95-101.
5. Kiani H, Haghighi A, Rostami A, Azargashb E, TABAEI SJS, Solgi A, Zebardast N. Prevalence, risk factors and symptoms associated to intestinal parasite infections among patients with gastrointestinal disorders in Nahavand, Western Iran. *Rev Inst Med Trop São Paulo*. 2016;58:42. <https://doi.org/10.1590/S1678-9946201658042>
6. Campuzano S, Flórez DM, Ibarra CM, Sánchez PP. Determinación de la calidad microbiológica y sanitaria de alimentos preparados vendidos en la vía pública de la ciudad de Bogotá D.C. *Nova*. 2015;13(23):81-92. <https://doi.org/10.22490/24629448.1708>
7. Cabanillas Torres G. Determinación de la presencia de *Listeria Monocytogenes* en quesos frescos artesanales provincia de Huarochirí, Lima-Perú. Lima: Universidad Ricardo Palma; 2019.
8. Bisbal-Murrugarra O, León-Barúa R, Berendson-Seminario R, Biber-Poillevard M. A new questionnaire for the diagnosis of dyspepsia. *Acta Gastroenterológica Latinoam*. 2002;32(1):25-8.
9. Barker SF, Amoah P, Drechsel P. A probabilistic model of gastroenteritis risks associated with consumption of street food salads in Kumasi, Ghana: Evaluation of methods to estimate pathogen dose from water, produce or food quality. *Sci Total Environ*. 2014;487:130-142. <https://doi.org/10.1016/j.scitotenv.2014.03.108>
10. Nguyen VD, Sreenivasan N, Lam E, Ayers T, Kargbo D, Dafee F, Jambai A, Alemu W, Kamara A, Islam MS, Stroika S, Bopp C, Quick R, Mintz ED, Brunkard JM. Cholera epidemic associated with consumption of unsafe drinking water and street-vended water-eastern Freetown, Sierra Leone, 2012. *Am J Trop Med Hyg*. 2014;90(3):518-23. <https://doi.org/10.4269/ajtmh.13-0567>
11. Luquero FJ, Rondy M, Boncy J, Munger A, Mekaoui H, Rymshaw E, Page AL, Toure B, Degail MA, Nicolas S, Grandesso F, Ginsbourger M, Polonsky J, Alberti KP, Terzian M, Olson D, Porten K, Ciglenecki I. Mortality Rates during Cholera Epidemic, Haiti, 2010-2011. *Emerg Infect Dis*. 2016;22(3):410-6. <https://doi.org/10.3201/eid2203.141970>
12. Asiegbu CV, Lebelo SL, Tabit FT. The food safety knowledge and microbial hazards awareness of consumers of ready-to-eat street-vended food. *Food Control*. 2016;60:422-9. <https://doi.org/10.1016/j.foodcont.2015.08.021>
13. Sarker N, Islam S, Hasan M, Kabir F, Uddin MA, Noor R. Use of multiplex PCR assay for detection of diarrheagenic *Escherichia coli* in street vended food items. *Am J Life Sci*. 2013;1(6):267-72. <https://doi.org/10.11648/j.ajls.20130106.15>
14. Talledo-Ulfe L, Buitrago OD, Filorio Y, Casanova F, Campos L, Cortés F, Mejía CR. Factores asociados a dispepsia no investigada en estudiantes de 4 facultades de medicina de Latinoamérica: estudio multicéntrico. *Rev*

- Gastroenterol México. 2018;83(3):215-22.  
<https://doi.org/10.1016/j.rgm.2017.05.009>
15. Vargas-Matos I, Ng-Sueng LF, Flores-Arriaga J, Beltrán-Flores S, Lema-Correa M, Piscoya A, Mayta-Tristán P. Superposición del síndrome de intestino irritable y dispepsia funcional basados en criterios ROMA III en estudiantes de medicina de una universidad privada de Lima, Perú. *Rev Gastroenterol Perú*. 2015;35(3):219-25.
  16. Lee S-W, Lien H-C, Lee T-Y, Yang S-S, Yeh H-Z, Chang C-S. Etiologies of dyspepsia among a Chinese population: One hospital-based study. *Open J Gastroenterol*. 2014;4(06):249.  
<https://doi.org/10.4236/ojgas.2014.46037>
  17. Yu J, Liu S, Fang XC, Zhang J, Gao J, Xiao YL, Zhu LM, Chen FR, Li ZS, Hu PJ, Ke MY, Hou XH. Gastrointestinal symptoms and associated factors in Chinese patients with functional dyspepsia. *World J Gastroenterol*. 2013;19(32):5357-64.  
<https://doi.org/10.3748/wjg.v19.i32.5357>