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Introduction

- Municipal public markets are crucial for the distribution of essential food and non-food products, especially for vulnerable populations, and are an important source of income for local businesses and producers, thus markets were allowed to remain open despite measures to reduce transmission.
- Market vendors might have a high risk of occupational exposure to SARS-CoV-2¹ given their close interaction with shoppers, but this risk has not been assessed in Guatemala.
- Seroprevalence of antibodies to SARS-CoV-2 used to assess exposure, detect mild and asymptomatic infections, and inform on immunity to guide decision-making. IgA early marker ~8 days to 6 months after symptom onset and IgG from ~21 days to >6 months.²
- We aimed to estimate the seroprevalence of antibodies as a measure of exposure in two municipal public markets in Guatemala and assess if having a vendor occupation or adopting preventive practices were associated with exposure to SARS-CoV-2

Methods

- Design:** Longitudinal cohort with two serosurveys, July-August and October-December, 2021.
- Study site:** Municipality of Santa Catarina Pinula; indoor public markets (Fig. 1).



Figure 1. View of one of the study sites

- Context:** SARS-CoV-2 Delta wave from June to October and vaccination campaign ramping in September, 2021.
- Population:** adult market workers (vendors, vendor assistants, administrative and maintenance personnel).
- Interview:** sociodemographic, occupational, vaccination status, history or symptoms of COVID-19, and preventive practices.
- Samples:** Venous blood and nasopharyngeal swab.
- Antibody detection:** Euroimmun® IgA and IgG against SARS-CoV-2 spike protein ELISA in plasma
- Virus detection:** non-commercial rRT-PCR of SARS-CoV-2 nucleocapsid gene³.
- Ethics:** Approved by the CHS-UVG and MoH ethics committees.
- Analysis:** Adjusted OR using generalized estimating equations with vendor occupation and adherence to preventive practices as risk factors for presence of antibodies (Fig 2).

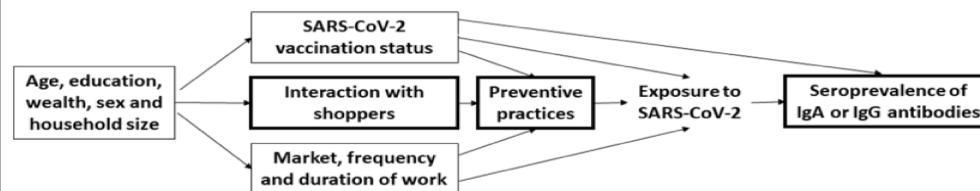


Figure 2: Hypothesized paths between interaction with shoppers, antibodies against SARS-CoV-2 and confounders.

Results

Figure 3: Participation flow

229 adult market workers
109 (48%) provided blood sample in the first survey
87 (80%) provided blood sample in the second survey

Baseline characteristics:

- 84 (77%) women
- 48 (44%) <30 years of age
- 67 (61%) with secondary education
- 104 (95%) Ladino ethnicity
- 5 (IQR: 4,6) median household size
- 47 (43%) work in market A

Table 1: Participant's characteristics

Characteristics	First survey (n=109) N (%)	Second survey (n=87) N (%)
Vendor occupation	88 (81)	72 (83)
Works 1-5 days a week	29 (27)	23 (26)
Works 6-7 days a week	80 (73)	64 (74)
<6 months since working at the market	22 (20)	18 (21)
7-12 months since working at the market	54 (50)	42 (48)
>12 months since working at the market	33 (30)	27 (31)
Fully vaccinated	2 (2)	30 (34)
Partially vaccinated	10 (9)	42 (48)
Not vaccinated	97 (89)	15 (17)
Always keep >1.5 meters distance while eating	68 (62)	80 (92)
Always the mask covering the nose and mouth	91 (83)	77 (89)
Always clean hands >20 seconds	49 (45)	53 (61)
Never attend social gatherings	75 (69)	58 (67)
Never shake hands	89 (82)	74 (85)

Table 2: Seroprevalence of antibodies

Group	Spike IgA		Spike IgG					
	First survey	Second survey	First survey	Second survey				
	N = 109	N = 87	N = 109	N = 87				
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Overall	67	61 (52, 71)	77	89 (80, 94)	58	53 (43, 63)	79	91 (83, 96)
Overall standardized¹	67	65 (48, 86)	77	91 (69, 100)	58	54 (39, 73)	79	93 (71, 100)
Not vaccinated	56	58 (47, 68)	13	87 (60, 98)	46	47 (37, 58)	9	60 (32, 84)
Partially vaccinated	9	90 (55, 100)	35	83 (69, 93)	10	100 (69, 100)	40	95 (84, 99)
Fully vaccinated²	2	100 (16, 100)	29	97 (83, 100)	2	100 (16, 100)	30	100 (88, 100)

¹Standardized to the distribution of sex, age group and market reported at the census.

²Fully vaccinated is defined as two weeks after the final dose of the primary series.

The prevalence of SARS-CoV-2 infection was **13% (n=14, 95% CI: 7-21%)** in the first survey and **1% (n=1, 95% CI: 0-6%)** in the second. Only **two** participants in the first survey reported symptoms 14 days before swab collection.

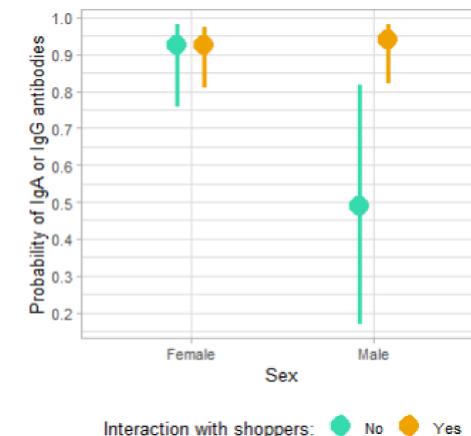


Figure 3: Interaction between sex and vendor occupation averaged over potential confounders

Adjusted OR for vendor occupation and the presence of antibodies:

- Males: 16.1 (95% CI: 2.6, 98.0)
- Females: 1.0 (95% CI: 0.3, 3.8)

The adjusted OR for IgA spike protein was **0.2 (95% CI: 0.1, 0.9)** and for IgG spike protein was **0.2 (95% CI: 0.0, 0.7)**.

Limitations

- Some exposed participants might have not been detected by ELISA because of low antibody levels.
- We did not assess neutralizing activity.
- We assessed preventive behaviors by interview, which could not represent actual adherence.
- Low precision because of small sample size.

Conclusions

- High seroprevalence before vaccination is indicative of high exposure of market workers to SARS-CoV-2.
- Increase of seroprevalence after vaccination is indicative of the effectiveness of the vaccine in producing antibody response against the virus.
- Higher seroprevalence of IgA during the first survey suggest detection of recent infections (8-15 days).
- Male market vendors are at higher risk of exposure to SARS-CoV-2 than male non-vendors.
- The correct use of a mask protects against exposure to SARS-CoV-2.
- High prevalence of asymptomatic infections exposes the need to reinforce permanent preventive practices.

References

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