

Household transmission of the Omicron Variant of SARS-CoV-2 – Results from the DigiHero study

B. Klee¹, S. Diexer¹, C. Xu¹, C. Gottschick¹, C. Hartmann¹, KM. Schlinkmann², A. Kuhlmann¹, J. Rosendahl¹, M. Binder¹, M. Gekle¹, M. Girndt¹, J. Hoell¹, I. Moor¹, D. Sedding¹, S. Moritz¹, T. Frese¹, R. Mikolajczyk¹

¹ University Medicine of the Martin-Luther-University Halle-Wittenberg, Germany
² MVZ Labor Krone eGmbH, Siemensstraße 40, 32105, Bad Salzflen, Germany

INTRODUCTION

- Studies reported that the Omicron variant, which spread rapidly worldwide by the end of 2021, is able to escape vaccine immunity and leads to high transmissibility¹.
- A meta-analysis in early 2022 estimated a secondary attack rate (SAR) of 42.7% for Omicron².
- Households are important settings for the transmission of SARS-CoV-2. Vaccination and boosters, as well as wearing masks and self-isolation in a household, can reduce the risk of secondary infections³.
- However, less is known about how the risk of acquiring a new infection depends on time since last infection/vaccination and the antibody titre at the time of exposure.

AIM

We aimed:

- to determine household transmission rates of omicron variants in a community setting with mixed immunity.
- to explore the effect of titre decrease and the time since last exposure (vaccination or infection) on the risk of acquiring an infection in the household.

METHOD

- We used the population based cohort study for digital health research in Germany (DigiHero).
- We invited 34,666 households between June and December 2022 to participate in a prospective household transmission study.
- Participants notified the study team in case of a positive SARS-CoV-2 test in the household.
- All household members received:



Dried Blood Spot Cards to determine antibody levels



Symptom Diaries and questionnaires

- GAM and logistic regression models were used for statistical analysis

RESULTS

- 262 households with 662 participants were included in the study.

Secondary Attack Rate (SAR)

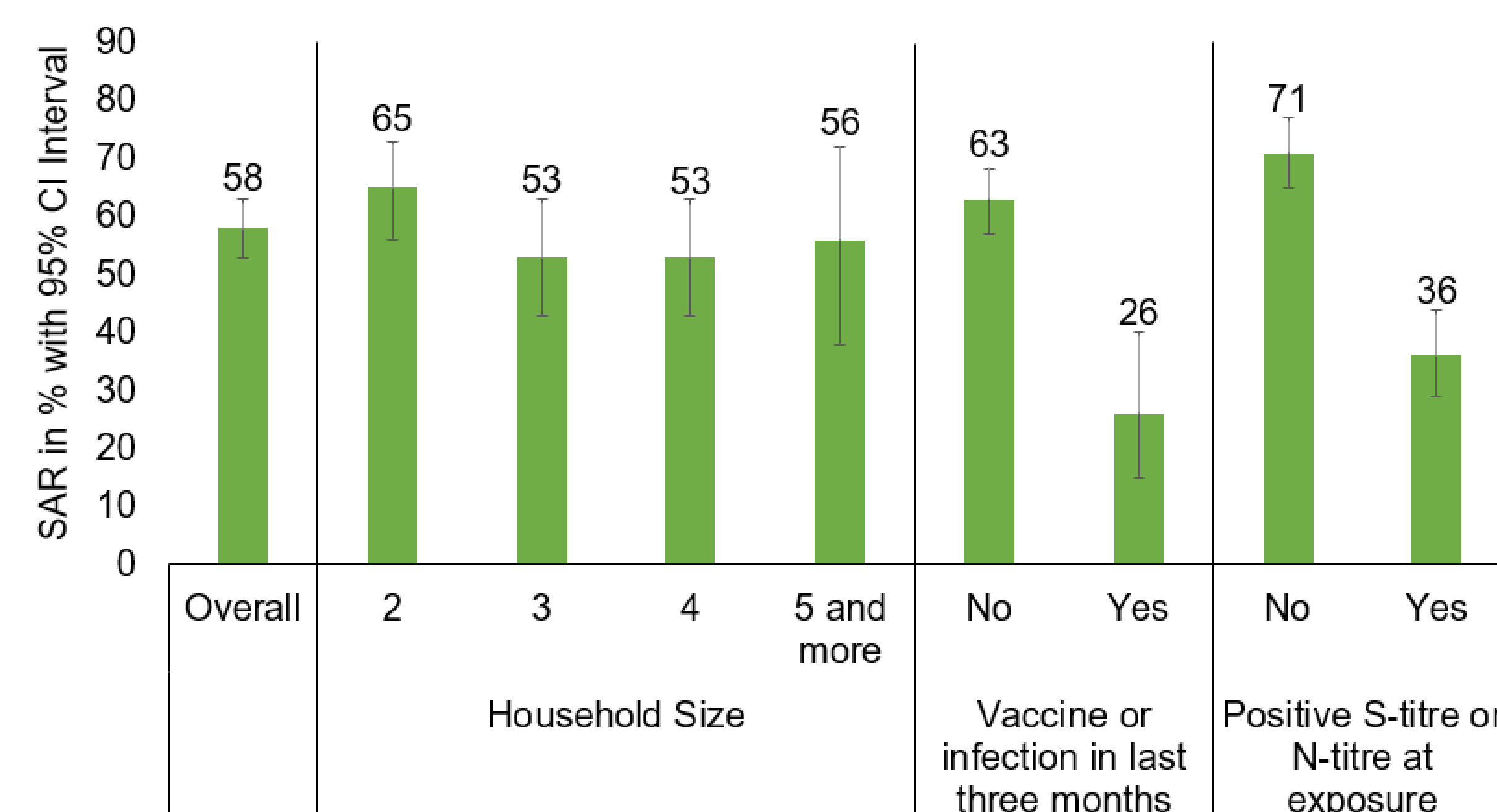


Figure 1: Secondary Attack Rate (SAR) with 95% Confidence Interval (CI) for different household sizes and for last exposure.

Risk of acquiring infection depending on previous exposure

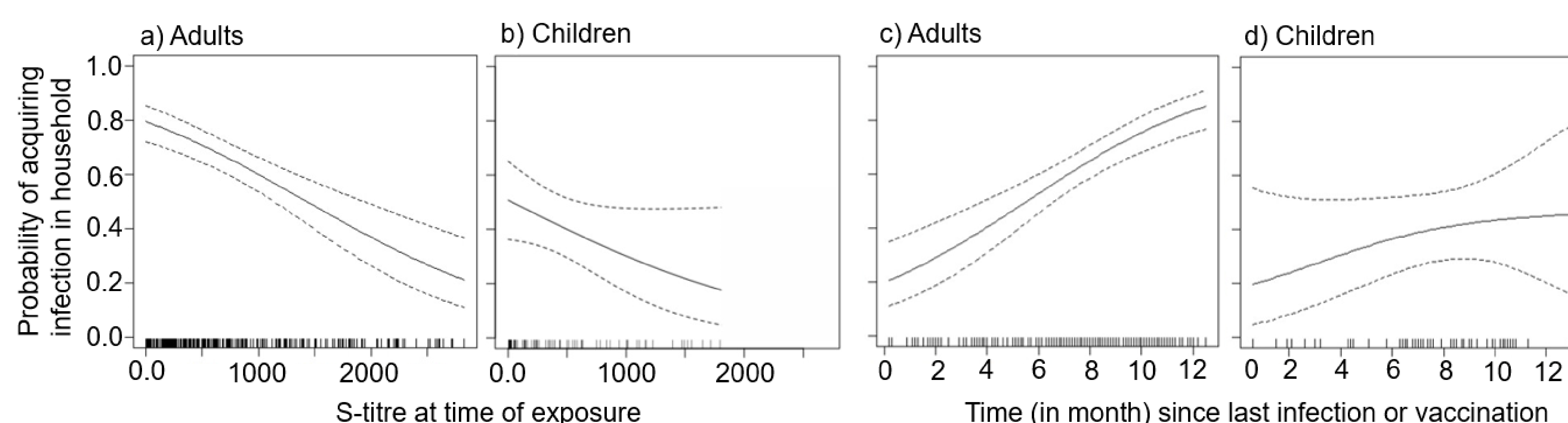


Figure 2: Probability of household transmission depending on protein S-titre at the time point of exposure in adults (a) and children (b) and by time since last exposure (vaccination or infection, c, d); censored at upper 5% to control for unstable estimation in the area of sparse data

Probability of household transmission

Table 1: Probability of infection acquisition in household transmission depending on different factors

Variable	Univariable Odds Ratio (95% CI)
Time since last vaccination or infection	Per one month 1.18 (1.10;1.26)
Direction of transmission	Adult to adult Ref.
	Child to adult 0.72 (0.39;1.32)
	Adult to child 0.38 (0.22;0.64)
	Child to child 0.34 (0.11;1.09)
Prevention measures	Yes Ref.
	No 1.68 (1.11;2.55)
Severity of symptoms of the index case	Strong symptoms Ref.
	Mild symptoms 0.74 (0.43;1.28)
	No symptoms 0.46 (0.08;2.81)

CONCLUSIONS

- The transmissibility of Omicron Variant of SARS-CoV-2 in a household exposure is high. Since some infections could have occurred independently, our study can overestimate the risk of household transmission.
- Vaccinations or preceding infections offer protection for up to 12 months (but linearly decreasing).
- Antibody titres are negatively correlated with the risk of acquiring infection. Only high titres and short time after previous exposure grant a high level of protection.

REFERENCES

- Mohsin M et al. Omicron SARS-CoV-2 variant of concern: A review on its transmissibility, immune evasion, reinfection, and severity. *Medicine (Baltimore)*. 2022;101(19):e29165.
- Madewell ZJ et al. Household Secondary Attack Rates of SARS-CoV-2 by Variant and Vaccination Status: An Updated Systematic Review and Meta-analysis. *JAMA Netw Open*. 2022;5(4):e229317.
- Baker JM et al. SARS-CoV-2 B.1.1.529 (Omicron) Variant Transmission Within Households - Four U.S. Jurisdictions, November 2021-February 2022. *MMWR Morb Mortal Wkly Rep*. 2022;71(9):341-346.

CONTACT INFORMATION

- Rafael Mikolajczyk, Prof. Dr.
- Institute for Medical Epidemiology, Biometry and Informatics, Medical Faculty of the Martin-Luther-University Halle-Wittenberg, Germany
- Email: rafael.mikolajczyk@uk-halle.de**