



Statins increase the risk of *S. aureus* nasal colonisation: A retrospective, case controlled, observational study

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Background. The World Health Organisation lists antimicrobial resistance among one of the top 10 threats for global health. While the increasing prevalence of antimicrobial resistance due to inappropriate antibiotic use is well documented, its propagation by concomitant use of non-antibiotics with antimicrobial properties, such as statins, is poorly investigated.¹ Given the increasing resistance levels of multiple bacteria, including *Staphylococcus aureus* (*S. aureus*), the potential contribution of such agents warrants research.

Aim. To investigate the impact of statin use on *S. aureus* nasal colonisation, and specifically

methicillin-resistant *S. aureus* (MRSA) compared to methicillin-sensitive *S. aureus* (MSSA) colonisation at a Perth tertiary hospital.

Methods. Data were obtained from 38,472 nasal swab records (collected between February 2015 and September 2020), which included *S. aureus* negative (Staph NEG), MRSA and MSSA nasal swabs. Only patients aged ≥45 years were included. A sample of 445 MRSA and 890 MSSA nasal swabs (Cases) were matched to 2670 *S. aureus* negative swabs (Controls). Case-control matching was based on same gender and age (± 5 years).

Table 2: Regression analysis results of associations between various *S. aureus* nasal colonisation outcomes and no colonisation (Staph NEG).

Parameter	Odds Ratio	95% CI	p-value
<i>S. aureus</i> nasal colonisation			
All statins	1.87	1.64-2.14	<0.0001
No statin	1 (reference)		
Atorvastatin	1.88	1.61-2.20	<0.0001
Pravastatin	1.60	0.87-2.95	0.1292
Rosuvastatin	2.07	1.70-2.52	<0.0001
Simvastatin	1.34	0.96-1.88	0.0854
No statin	1 (reference)		
MRSA nasal colonisation			
All statins	1.28	1.04-1.57	0.0180
No statin	1 (reference)		
Atorvastatin	1.39	1.10-1.77	0.0063
Pravastatin	1.18	0.45-3.09	0.7338
Rosuvastatin	1.12	0.79-1.54	0.5513
Simvastatin	1.16	0.70-1.93	0.5559
No statin	1 (reference)		
MSSA nasal colonisation			
All statins	2.26	1.94-2.64	<0.0001
No statin	1 (reference)		
Atorvastatin	2.20	1.84-2.64	<0.0001
Pravastatin	1.88	0.45-3.74	0.0703
Rosuvastatin	2.71	2.18-3.37	<0.0001
Simvastatin	1.46	0.99-2.17	0.0572
No statin	1 (reference)		
MSSA vs MRSA (controls)			
All statins	1.77	1.41-2.27	<0.0001
No statin	1 (reference)		
Atorvastatin	1.58	1.21-2.07	0.0008
Pravastatin	1.59	0.56-4.58	0.3866
Rosuvastatin	2.45	1.72-3.50	<0.0001
Simvastatin	1.56	0.71-2.24	0.4360
No statin	1 (reference)		

Table 1: Sample nasal swab colonisation data based on patient gender and age.

Gender	Age in years			Nasal colonisation		
	Mean	SD	Range	MRSA	MSSA	Staph NEG
Male n=2880 (71.9%)	67.9	11.3	45-96	320	640	1920
Female n=1125 (28.1%)	68.1	12.3	45-96	125	250	750

Results. The sample (n=4005) included **more male (71.9%)** than **female (28.1%)** nasal swabs from patients aged 45-96 years old (Table 1).

Positive *S. aureus* (MRSA and MSSA) nasal colonisation was recorded in 696/1679 (**41.5%**) of swabs from patients who were **taking a statin**, and in 639/2326 (**27.5%**) of those **not taking a statin** at the time of nasal swab (Figure 1).

Statin use was associated with a significant increased risk of *S. aureus* nasal colonisation (OR 1.87; p<0.0001) compared to no *S. aureus* nasal colonisation (Staph NEG), and in particular with **atorvastatin (OR 1.88)** and **rosuvastatin (OR 2.07)** (Table 2).

Furthermore, **associations were significant** in both the **female (OR 1.65)** and **male (OR 1.97)** populations. Associations were also **significant for MRSA (OR 1.28)** and **MSSA (OR 2.26)** colonisation when compared to Controls in regression analyses, with the statin use associated with a greater risk for **MSSA compared to MRSA colonisation (OR 1.77)**.

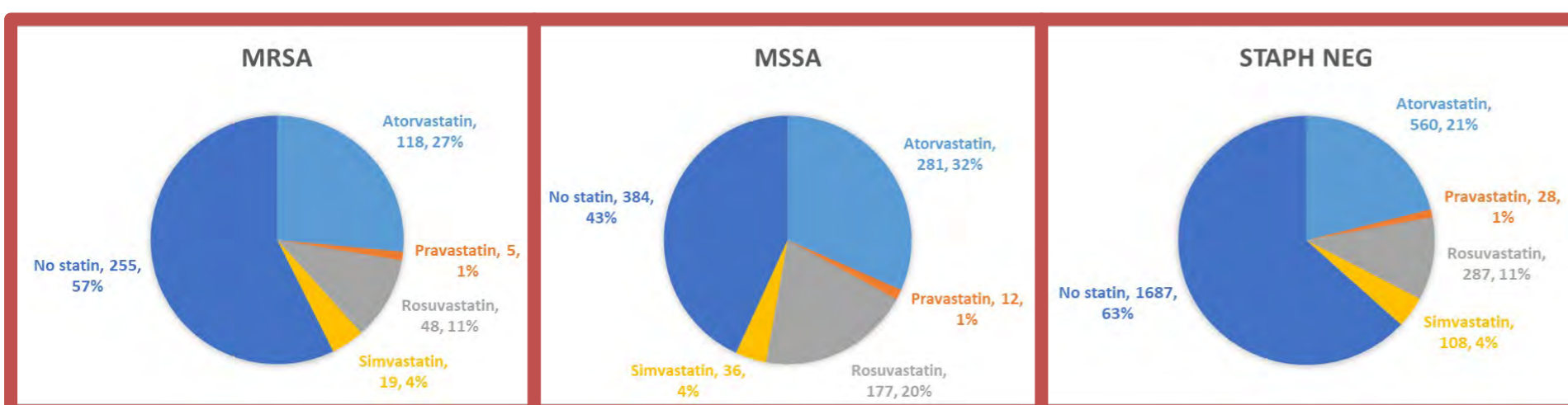


Figure 1: Nasal colonisation data with respect to the statin agents used at the time of nasal swabs across the three study populations: MRSA, MSSA and Staph NEG

Discussion. The study revealed that statin use is associated with increased risk of *S. aureus* nasal colonisation. These findings reinforce the need to consider appropriate use of all drugs in the fight against antimicrobial resistance, which may have implications on the benefit of statin use for primary prevention of coronary heart disease. However, further research is required to prove causality before any changes to practice are made.

References.

1. Ko HHT, et al. Statins: antimicrobial resistance breakers or makers? PeerJ. 2017;5:e3952.