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Associations between different mask wearing patterns and rosacea severity

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To the Editor:

Rosacea is a chronic, relapsing inflammatory skin disease associated with many environmental triggers [1,2]. Research on associations of mask-wearing and rosacea flares is limited. We explore relationships between different patterns of face mask on various rosacea symptoms and severity.

This study was approved by the Wake Forest University School of Medicine Institutional Review Board. An online survey of adults (≥ 18 years) with self-reported history of a rosacea was disseminated through Amazon Mechanical Turk. Respondents who inappropriately answered an attention-check question were eliminated. Questions assessed sociodemographic information, mask wearing patterns, and rosacea severity using a validated rosacea self-assessment tool (RSAT), [3]. Self-reported rosacea severity was graded by participants on a 4-point Likert scale (1-clear/almost clear; 4-severe disease) for each symptom: erythema, papules, ocular involvement, and rhinophyma. A summative component of erythema and papules was also calculated (2-clear/almost clear; 8-severe). Participants reported symptom severities prior to and during mask wearing behaviors.

Rosacea self-assessment tool scores during mask wearing compared to baseline prior to mask wearing was the primary outcome. Binomial logistic regression models examined associations between

changes in rosacea severity (dependent variable) and mask-wearing patterns (independent variable). Multivariate models controlled for age (< 50 years, ≥ 50 years), race (white, non-white), gender (male, female), last dermatology visit (within two years, more than two years or never), and baseline severity of the respective rosacea symptom.

Approximately 66% of respondents appropriately answered the attention check question. Overall, 170 participants were included (**Table 1**). Most participants reported no change in rosacea severity (**Table 2**). In multivariate models, mask wearing of > 12 hours versus < 1 hour daily was associated with worsening RSAT erythema (aOR=30.42 [2.53-365.27], $P=0.0071$) and RSAT combined erythema and papules scores (18.37 [2.24-150.55], $P=0.0067$). In multivariate models, wearing masks for half the week or less, compared to regular daily mask wearing was associated with decreased odds of worsening rhinophyma (0.28 [0.08-0.93], $P=0.0372$).

A minority of participants reported worsening of rosacea during mask wearing mandates. Erythema and rhinophyma were the most and least frequently reported symptoms that worsened, respectively. Our results suggest cumulative duration of mask contact with skin, but not mask type or frequency of replacing individual masks may exacerbate rosacea associated erythema, papules, and rhinophyma. In

Table 1. Characteristics of cohort (N=170).

Characteristics	Value
Age (years) – freq (%)	
<50	145 (87.88)
≥50	20 (12.12)
Sex - freq (%)	
Male	63 (38.41)
Female	101 (61.59)
Race - freq (%)	
White	109 (67.29)
Non-white	53 (32.72)
Insurance coverage - freq (%)	
Private	79 (47.88)
Public or Uninsured	86 (52.12)
Highest Education -freq (%)	
Associates or less	61 (36.97)
Bachelors or graduate	104 (63.03)
Mask Type	
Respirator*	52 (31.52)
Cloth	77 (46.67)
Surgical	36 (21.82)
Last dermatology visit - freq (%)	
Never	8 (4.85)
Within last 2 years	124 (75.15)
Over 2 years ago	33 (20.00)
Baseline erythema severity[#]	
Mild-moderate	147 (86.47)
Severe-very severe	23 (13.53)
Baseline papule severity[#]	
Mild-moderate	137 (81.07)
Severe-very severe	32 (18.93)
Baseline ocular severity[#]	
Mild-moderate	143 (84.12)
Severe-very severe	27 (15.88)
Baseline rhinophyma severity[#]	
Mild-moderate	144 (84.71)
Severe-very severe	26 (15.29)
Baseline combined erythema and papule severity[§]	
Mild-moderate	131 (77.06)
Severe-very severe	39 (22.94)
Most bothersome symptoms since started wearing mask	
Erythema	59 (35.76)
Pruritis/dryness/pain	82 (49.70)
Papules	15 (9.09)
None	9 (5.45)

Missing values present in N=5 for age, N=6 for gender, N=8 for race, N=5 for insurance and N=5 for education, N=5 for mask type, N=5 for last dermatology visit, N=5 for most bothersome symptoms, and N=1 baseline papules severity.

*Respirator included N-95, KN-95, cone masks.

[#]Symptom severities were derived from a 4-point Likert scale (1-clear/almost clear; 4-severe).

[§]Calculated by adding baseline erythema and papules severities into a single combined severity category.

contrast, mask wearing patterns do not appear to be a significant trigger for ocular rosacea.

Mask wearing may exacerbate rosacea by increasing skin irritation, temperature, trans-epidermal water

Table 2. Change in rosacea severity during COVID-19 mask wearing.

Symptom	Number of participants with certain change in rosacea severity scores* N (%)						
	-3	-2	-1	0	1	2	3
Erythema	0 (0.00)	4 (2.35)	25 (14.71)	86 (50.59)	47 (27.65)	6 (3.53)	2 (1.18)
Papules	2 (1.18)	5 (2.96)	23 (13.61)	89 (52.66)	41 (24.26)	6 (3.55)	3 (1.78)
Ocular	0 (0.00)	3 (1.76)	14 (8.24)	109 (64.12)	34 (20.00)	8 (4.71)	2 (1.18)
Rhinophyma	1 (0.59)	5 (2.94)	30 (17.65)	105 (61.76)	24 (14.12)	4 (2.35)	1 (0.59)
	-6 and -5	-4 and -3	-2 and -1	0	1 and 2	3 and 4	5 and 6
Erythema and papules combined	1 (0.59)	3 (1.77)	33 (19.41)	66 (38.82)	60 (35.3)	5 (2.94)	3 (1.77)

*Difference of RSAT scores during mask wearing compared to baseline RSAT scores before mask wearing. Individual symptom severities were derived from a 4-point Likert scale (1-clear/almost clear; 4-severe). Individual erythema and papules severities were added to establish the combined severity category of erythema and papules (2-clear/almost clear; 8-severe). Positive values indicate greater severity (higher RSAT score) during mask wearing compared to baseline. A value of zero indicates no change.

loss, sebum content, and greater *Demodex*-associated inflammation [2,4,5]. When appropriate from a public health perspective, some patients with rosacea may benefit from limiting their daily mask use. If masks are needed, other approaches may be needed to help control patients' rosacea.

Study strengths include evaluation of a large sample size, examination of multiple mask-wearing patterns and rosacea symptoms, and control for confounders in multivariate models. Reliance on self-reported data derived from the general public is a limitation. Also, despite being a validated outcome measure, the RSAT requires further examination of other psychometric domains including interpretability [3]. Future practice-based studies investigating associations between mask wearing and rosacea severity are warranted.

Potential conflicts of interest

Feldman has received research, speaking and/or consulting support from Eli Lilly and Company, GlaxoSmithKline/Stiefel, AbbVie, Janssen, Alovtech, vTv Therapeutics, Bristol-Myers Squibb, Samsung, Pfizer, Boehringer Ingelheim, Amgen, Dermavant, Arcutis, Novartis, Novan, UCB, Helsinn, Sun Pharma, Almirall, Galderma, Leo Pharma, Mylan, Celgene, Ortho Dermatology, Menlo, Merck & Co, Qurient, Forte, Arena, Biocon, Accordant, Argenx, Sanofi, Regeneron, the National Biological Corporation, Caremark, Teladoc, Eurofins, Informa, UpToDate and the National Psoriasis Foundation. He is founder and part owner of Causa Research and holds stock in Sensal Health. The remaining authors declare no conflicts of interest.

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