Covid-19 presentation among symptomatic healthcare workers in Ireland

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Background  It is recognized that healthcare workers (HCWs) are at high risk of contracting Covid-19. It is incumbent on occupational health staff to recognize potential symptoms of Covid-19 among HCWs.

Aims  The aims of the study were to describe the presenting symptoms of HCWs who developed Covid-19 in Ireland, and to estimate the odds of specific symptoms being associated with a positive Covid-19 polymerase chain reaction (PCR) result.

Methods  A retrospective chart review of all symptomatic HCWs who self-presented for Covid-19 testing in Cork from March to May 2020 was conducted. A sex-matched case–control study was carried out to compare presenting features among those who tested positive compared to those who tested negative. Univariate and multivariable-adjusted conditional logistic regression models were run using Stata 15.0 to identify the symptoms associated with positive Covid-19 swab results.

Results  Three hundred and six HCWs were included in the study; 102 cases and 204 controls. Common presenting features among cases were fever/chills (55%), cough (44%) and headache (35%). The symptoms which were significantly associated with a positive Covid-19 swab result were loss of taste/smell (adjusted odds ratio [aOR] 12.15, 95% confidence interval [CI] 1.36–108.79), myalgia (aOR 2.36, 95% CI 1.27–4.38), fatigue (aOR 2.31, 95% CI 1.12–4.74), headache (aOR 2.11, 95% CI 1.19–3.74) and fever/chills (aOR 1.88, 95% CI 1.12–3.15).

Conclusions  Fever, fatigue, myalgia, loss of taste/smell and headache were associated with increased odds of a Covid-19 diagnosis among symptomatic self-referred HCWs compared with those who had negative swab results. Testing criteria for HCWs should reflect the broad range of possible symptoms of Covid-19.

Key words  Covid-19; healthcare worker; occupational health; SARS-CoV-2; symptoms.

Introduction  Cardinal symptoms of Covid-19 are fever, new cough and dyspnoea [1]. As the pandemic has evolved, the literature has highlighted a myriad of other presenting symptoms, including anosmia, hypogeusia, headache and diarrhoea [2–5]. The wide spectrum of presenting symptoms makes it difficult to discern which suspect cases are more likely to test positive for SARS-CoV-2 infection.

In Ireland, one-third of all confirmed cases of Covid-19 were among healthcare workers (HCWs) in the ‘first wave’ of the pandemic up to mid-July 2020 [6]. Early identification of infected HCWs is vital to minimize the risk of SARS-CoV-2 transmission to patients, other HCWs and the public. This is also necessary for maintaining workplace health and safety, and sustaining adequate levels of staffing. In this paper we present the descriptive epidemiology of symptomatic HCWs who self-presented for Covid-19 testing, during the first 12 weeks of the pandemic. We undertook a case–control study to estimate the odds of a positive Covid-19 swab result during this time, based on HCWs’ presenting symptoms.

Methods  The Occupational Health Department (OHD) in Cork University Hospital (CUH), Ireland, had a dedicated testing centre for nasopharyngeal polymerase chain reaction (PCR) swab referrals. Any new or unexplained medical symptoms were considered an indication for testing, this did not have to be a ‘typical’ symptom of Covid-19. Symptomatic HCWs self-presented by contacting the OHD directly; testing was arranged within 24 h. The OHD provides support to HCWs who are employed in...
public healthcare facilities in Cork. Thus, HCWs who were employed in private facilities, or self-employed, were not included in the study. Cases of SARS-CoV-2 infection were defined as symptomatic HCWs who had a positive Covid-19 swab result. Controls were defined as symptomatic HCWs whose swab did not detect Covid-19. Cases and controls were selected from the same study period; 9th of March to 31st of May 2020. Asymptomatic HCWs were excluded. We included two sex-matched controls for each case to reduce the possibility of confounding by sex, or by unmeasured sex-specific factors, and to enhance statistical power.

HCW role was categorized as medical, nursing, allied health professional (physiotherapy or pharmacy) or support staff (including healthcare assistants, multi-task attendants, cleaning, security, clerical and catering). The location of work was divided into three categories; Community hospitals (residential long-stay facilities), Model 2 hospitals (local/district hospitals which admit low acuity medical patients) and Model 4 hospital (large tertiary hospital) [7].

We collected information from paper records held in the OHD on the HCWs’ presenting symptoms. The HCW was not examined by a doctor prior to testing. Data were recorded in Microsoft Excel in an irrevocably anonymized form. The data were transferred to Stata 15.0 and random matching by sex was undertaken.

We used multivariable-adjusted conditional logistic regression with backward selection to identify the demographic factors or presenting symptoms most strongly associated with positive Covid-19 swab results. We did not include work location in the adjusted models since some community hospitals experienced large outbreaks of Covid-19 during the study period; this may have disproportionately impacted on the likelihood of HCWs testing positive.

Ethical approval for the study was granted by the Clinical Research Ethics Committee of the Cork University Teaching Hospitals.

Results
There were 102 positive cases and 204 sex-matched controls. There was no significant difference in mean age at presentation between cases and controls. The majority of HCWs were either nurses 47% (n = 143) or support staff 35% (n = 108) (Table 1). The most common presenting symptoms among cases were fever/chills (55%), cough (44%), headache (35%), sore throat (31%) and myalgia (29%). Controls were most likely to present with cough (52%), sore throat (38%) or fever/chills (37%).

As shown in Table 2, no significant differences by age or work role were observed.

The symptoms which were significantly associated with a positive Covid-19 swab result were anosmia/hypogeusia (adjusted odds ratio [aOR] 12.15, 95% confidence interval [CI] 1.36–108.79), myalgia (aOR 2.36, 95% 1.27–4.38), fatigue (aOR 2.31, 95% CI 1.12–4.74), headache (aOR 2.11, 95% CI 1.19–3.74) and fever/chills (aOR 1.88, 95% CI 1.12–3.15). Other symptoms did not help to discriminate cases versus controls.
Discussion

The study outlines the frequency of specific symptoms among Covid-19 positive HCWs and it helps to highlight the wide spectrum of relevant symptoms which may warrant inclusion in Covid-19 testing criteria.

Five specific symptoms helped to discriminate Covid-19 positive HCWs from negative controls: fever, fatigue, myalgia, anosmia/hypogeusia and headache. Although onset of new cough is a cardinal feature of Covid-19 infection, it was a common symptom among HCWs who self-presented for testing in our study, including among those in whom Covid-19 was not detected. A small minority of HCWs in our study reported anosmia/hypogeusia. Nonetheless, these symptoms were strongly associated with a positive Covid-19 swab result and this is consistent with previous research [5]. Fever, myalgia and fatigue also helped to discriminate positive cases from controls. These symptoms are common presentations of influenza [8]. This demonstrates the difficulty in differentiating Covid-19 infection from influenza based on self-reported symptoms. This highlights the increased need for widespread influenza vaccination of HCWs during the Covid-19 pandemic [8].

Our study is largely representative of HCWs in public hospitals in Ireland in terms of gender, age and role [9].

Selection bias is a potential limitation since HCWs self-presented for testing. Negative controls may have had a higher representation of the ‘worried well’, and presenting symptoms were not objectively measured. A negative or ‘not detected’ swab result only reflects a single point in time and we cannot exclude the possibility of false negatives among our controls. Given that knowledge of Covid-19 symptoms evolved during the study period, we cannot exclude the possibility that the date of testing may have led to some unmeasured information bias.

Another limitation to consider is the reliability of the nasopharyngeal PCR test. Studies have shown it to have a false-negative rate between 2 and 29% [10].

| Table 1. Characteristics of HCWs who presented for Covid-19 testing in Cork, and their symptoms at presentation, March–May 2020 |
|---------------------------------------------------------------|
| Cases, n (%) | Controls, n (%) | $\chi^2$: P |
|----------------|-----------------|-------------|
| Gender | | |
| Female | 79 (77) | 158 (77) |
| Male | 23 (23) | 46 (23) |
| Age | | |
| Mean (SD) | 44.1 ± 11.2 | 41.9 ± 11.1 | 0.10 |
| 20–39 | 35 (34) | 78 (38) | 0.76 |
| 40–49 | 36 (35) | 75 (37) |
| 50–59 | 24 (24) | 38 (19) |
| 60+ | 7 (7) | 13 (6) |
| Role | | |
| Doctor | 10 (10) | 21 (10) | 0.68 |
| Nurse | 52 (51) | 91 (45) |
| Allied health professional* | 6 (6) | 18 (9) |
| Support staff** | 34 (33) | 74 (36) |
| Location | | |
| Community hospital | 36 (35) | 32 (16) | <0.001 |
| Model 2 hospital | 37 (36) | 63 (31) |
| Model 4 hospital | 29 (28) | 109 (53) |
| Symptoms | | |
| Pyrexia/chills | 56 (55) | 76 (37) | <0.01 |
| Cough | 45 (44) | 55 (52) | 0.23 |
| Dyspnoea | 9 (9) | 27 (13) | 0.26 |
| Chest tightness | 14 (14) | 17 (8) | 0.14 |
| Fatigue | 23 (23) | 17 (8) | <0.01 |
| Myalgia | 30 (29) | 27 (13) | <0.01 |
| Headache | 36 (35) | 40 (20) | <0.01 |
| Sore throat | 32 (31) | 79 (38) | 0.21 |
| Rhinitis | 11 (11) | 24 (12) | 0.80 |
| Nasal congestion | 9 (9) | 11 (5) | 0.25 |
| Anosmia | 4 (4) | 1 (1) | 0.04 |
| Hypogeusia | 4 (4) | 0 (0) | 0.01 |
| Diarrhoea | 1 (1) | 2 (1) | 1.00 |
In conclusion, fever, fatigue, myalgia, anosmia/hypogeusia and headache were associated with Covid-19 diagnosis among self-presenting HCWs in Ireland. This supports the need for these symptoms to be included in testing criteria for Covid-19.

Funding
This study was not funded.

Competing interests
None declared.

Acknowledgements
None declared.

References
1. Jiang F, Deng L, Zhang L, Cai Y, Cheung CW, Xia Z. Review of the clinical characteristics of coronavirus disease 2019 (COVID-19). J Gen Intern Med 2020;35:1545–1549.
2. Bénézit F, Le Turnier P, Declerck C et al. Utility of hyposmia and hypogeusia for the diagnosis of COVID-19. Lancet Infect Dis 2020;20:1014–1015.
3. Fu L, Wang B, Yuan T et al. Clinical characteristics of coronavirus disease 2019 (COVID-19) in China: a systematic review and meta-analysis. J Infect 2020;80:656–665.
4. Zhao Y, Cui C, Zhang K et al. COVID19: a systematic approach to early identification and healthcare worker protection. Front Public Health 2020;8:205.
5. Menni C, Valdes AM, Freidin MB et al. Real-time tracking of self-reported symptoms to predict potential COVID-19. Nat Med 2020;26:1037–1040.
6. Health Protection Surveillance Centre. Epidemiology of COVID-19 in Ireland Report Prepared by HPSC on 21/07/2020 for NPHET. https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/casesinireland/epidemiologyofcovid-19inireland/COVID-19%20Daily%20epidemiology%20report%20(NPHET)%2010%20%20Website.pdf (20 December 2020, date last accessed).
7. Mealy K, Keane F, Kelly P, Kelliher G. What is the future for General Surgery in Model 3 Hospitals? Ir J Med Sci 2017;186:225–233.
8. Grech V, Borg M. Influenza vaccination in the COVID-19 era. Early Hum Dev 2020;148:101516.
9. Health Protection Surveillance Centre. Report of the Profile of COVID-19 Cases in Healthcare Workers in Ireland. https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/casesinireland/epidemiologyofcovid-19inireland/COVID-19_HCWeekely_report_19062020_v1.0%20Website.pdf (20 December 2020, date last accessed).
10. Arevalo-Rodriguez I, Buitrago-Garcia D, Simancas-Racines D et al. False-negative results of initial RT-PCR assays for COVID-19: a systematic review. PLoS One 2020;15:e0242958.