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Impact of COVID-19 lockdown on injury risk in Qatar's professional football

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ABSTRACT

Objectives: To compare injury incidence, burden and characteristics between the pre- and post-COVID-19 lockdown periods in Qatari professional football.

Design: Prospective cohort study.

Methods: Injury and exposure data for two post-COVID-19 lockdown periods [early post-lockdown period: short-term ~2 months (54 matches) and late post-lockdown period: long-term 8-months (183 matches)] were compared to the benchmark of the same periods from the three previous seasons (2017/18–2019/20).

Results: We observed no difference in overall, training or match incidence between early post-lockdown period and the benchmark reference. However, this short-term period resulted in lower burden for overall- (RR 0.80, $P < 0.0001$), training- (RR 0.73, $P < 0.0001$) and match-injuries (RR 0.40, $P < 0.0001$) compared to the benchmark. During late post-lockdown period match injury incidence (RR 0.72, $P = 0.0010$) and match injury burden (RR 0.69, $P < 0.001$) were lower than the benchmark. In contrast, both overall- (RR 1.30, $P < 0.001$) and training-injury burden (RR 1.65, $P < 0.001$) were higher. A significant increase in adductor strains in both post-lockdown periods was observed.

Conclusions: Immediately after the COVID-19 lockdown (short-term effect), there was no difference in injury incidence but a lower injury burden compared to benchmark. Moreover, the rapid return to competition for the successive season (long-term effect) was associated with a higher overall- and training-injury burden, but a lower match-injury burden compared to the benchmark.

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Practical implications

- The injury-burden decreased for the short-term post-COVID-19 lockdown period compared to benchmark.
- Following a 7-day inter-season break, we observed a higher overall injury burden and training injury burden but a lower match injury burden when compared to the benchmark period.
- The change in training and match schedules should be considered carefully by the medical team.

1. Introduction

The 2020 COVID-19 pandemic caused a worldwide lockdown and suspension of professional sports. As for most other countries in the world, the adult male professional league in Qatar was suspended for

a period due to the infection prevention measures decided by national health authorities.¹ During the 84-day period of football inactivity, players followed individualized training programs to be completed from home. Then, after a hotel quarantine period, teams resumed training to play 54 official matches in 53 days in order to complete the missing matches from the suspended season.

It is well recognized that a steep increase in training load represents one important risk factor for injury in football.² The pandemic lockdown represents an interesting model to investigate the consequences of sudden changes in load and several studies have investigated the effect of the mid-season COVID-19 lockdown on football injuries. The results diverge from showing an unexpected positive effect on injury occurrence,³ to no effect,⁴ or to a significant risk increase.^{5–7} This diversity in conclusions may be due to the difference in contexts, with the majority of studies having at least one of the following limitations: (i) data collected from public databases,^{3,8,9} (ii) non-specific injury reporting,^{3,8,9} (iii) a small total number of injuries,¹⁰ (iv) using a different reporting system from pre- to post-COVID-19 lockdown,⁹ (v) multiple contexts/different leagues⁴ and/or (vi) heterogeneous

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population.⁴ An additional question is if injury risk could be impacted when the training load modification is also accompanied by a challenging situation with psychological stress due to the lockdown itself.¹¹

The Qatar Stars League (QSL) Injury Surveillance Program was founded in 2009 and is currently the largest national scientific database of prospective injury registration in professional football.^{1,12–17} The aim of this investigation was to assess whether there were any changes in injury risk and characteristics in two distinct phases—immediate (within the first two months) and later (the subsequent season)—after the COVID-19 lockdown. Utilizing a study design that sidesteps the limitations of previous studies published on the topic so far.

2. Methods

We recorded individual time-loss injuries and training/match exposure in adult male professional footballers from Qatar. Due to the difference in competition schedules between the first and second divisions, only the 12 first division teams were included and monitored throughout the domestic season, as well as periods of international camps or tournaments. We included teams that provided at least six consecutive months of data and fulfilled the minimum standard of data quality (i.e., completeness, consistency, timeliness, accuracy, validity). We included players aged 18+ years, being either a first-team squad member or training regularly with the first team. Players with pre-existing injuries at the start of each season were included in the study only after successful return to play from these conditions. Players newly recruited to a club were included from their recruitment date.

The team physician in each club was responsible for collecting the data, using standardized tools. We distributed a detailed study manual outlining the details of data collection to the team doctor before the team's enrollment into the study. We also organized personal demonstration sessions when a new team physician joined the program. We recorded data using a custom-made Microsoft Excel® file for quick data entry, using pull-down menus to classify each injury based on the Sport Medicine Diagnostic Coding System. We asked the clubs to submit their data every month by corporate-protected email. According to the IRB approved research protocol (ADLQ-IRB: E2017000252), team physicians or physiotherapists verbally informed all players

about the purposes and procedures of the study and the latter provided verbal consent before being included.

To facilitate comparison with previous studies, injury definitions and data collection procedures followed the 2006 consensus statement¹⁸ on epidemiological studies in football. The results are reported according to the 2020 IOC consensus statement¹⁹ on injury and illness epidemiology.

We recorded all injuries resulting in a player being unable to fully participate in training or match play (e.g., 24-hour time-loss injuries). The player was considered injured until the team medical staff allowed full participation in training and availability for match selection. We also report individual player exposure during training sessions and matches (individual session duration for each player, in min). We did not record injuries that did not cause time off from football activities, or injuries occurring outside football activities.

We recorded the following characteristics for each injury: Diagnosis, onset (sudden vs. gradual), severity (number of days of time loss), and the following injury characteristics: (i) type, (ii) body part, (v) training or match injury (cases of gradual-onset injuries, where the injury could not be clearly attributed to a specific session, were classified as not applicable). We have classified cases as missing data when, despite all efforts to retrieve the data, the information could not be obtained.

The QSL football season usually starts in July with a pre-season focusing on training and friendly matches. Official matches normally start in August and end in May. Due to the COVID-19 pandemic lockdown, the 2019/20 and 2020/21 season schedules were changed (Fig. 1). The 2019/20 season started as normal (July 2019) but, due to the COVID-19 pandemic, the QSL league matches and trainings were stopped from March 15, 2020 to June 7, 2020. During this period, players followed individualized training programs that they had to complete from home. After a break of 84 days due to lockdown/restrictions conditions, from June 8 to June 30 the teams were quarantined in a hotel for a strict prevention measures' pre-training camp before resuming training on July 1. The regular training was then followed by 54 official matches (to complete the missing matches from 2019/20 season). The last match of this period, early post-lockdown period, was played on August 23. After 7 days, the successive 2020/21 season was started on September 1, 2020 and ended on April 28, 2021 (late post-lockdown period). During late post-lockdown period, 183 official

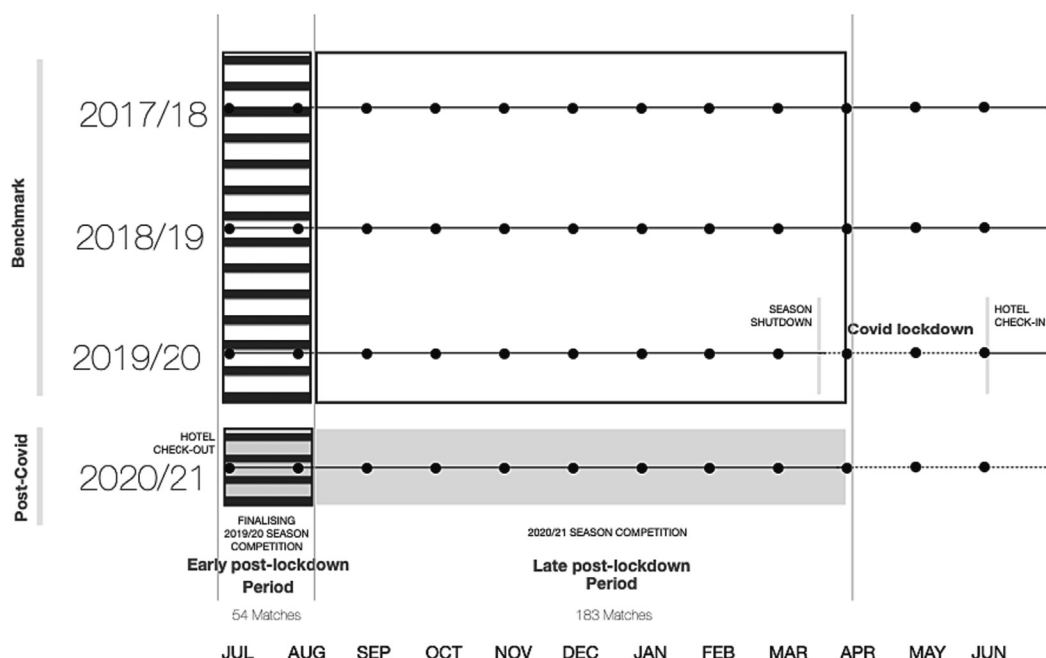


Fig. 1. COVID-19 lockdown consequences to QSL benchmark seasons.

matches were played. The three previous seasons, 2017/18, 2018/19 and 2019/20 (until the last official match, before COVID-19 lockdown), were used as benchmark for comparisons with post-COVID periods 1 and 2.

We included two post-lockdown periods in our analysis due to their distinct conditions. Early post-lockdown period captures the immediate effects of return to play following lockdown, while late post-lockdown period reflects the impact of a quick transition to a new season after a brief 7-day break.

Injury incidence is reported as the number of injuries per 1000 h [$(\sum \text{injuries} / \sum \text{exposure hours}) \times 1000$] with a corresponding 95 % confidence interval (CI). Injury burden is reported as the number of days lost per 1000 h [$(\sum \text{days} / \sum \text{exposure hours}) \times 1000$] with a corresponding 95 % confidence interval (CI).

The injury incidence and burden during the post-COVID periods were compared to the injury incidence and burden during benchmark periods using the rate ratio (RR) and its corresponding 95 % CI.

Injury characteristics by body parts before and after the COVID lockdown were compared by using crosstabs and χ^2 tests, including adjusted standardized residuals. For this analysis, injuries were classified according to each characteristic and frequencies were independently calculated for before and after the lockdown. The significance level was set at $p < 0.05$.

3. Results

The injury count and exposure over the four seasons are presented in Table 1.

Injury incidence, injury burden and training to match ratio during early post-lockdown period and 2, as well as the corresponding periods from the previous three benchmark seasons, are presented in Fig. 2.

There was no significant difference in overall, training or match incidence between early post-lockdown period and the benchmark from the three previous seasons. However, during early post-lockdown period, lower burden than benchmark seasons was observed for (i) overall (RR 0.80; 95 % CI 0.76 to 0.86; $P < 0.0001$), (ii) training (RR 0.73; 95 % CI 0.66 to 0.79; $P < 0.0001$) and (iii) match-injuries (RR 0.40; 95 % CI 0.36 to 0.46; $P < 0.0001$). Training to match ratio during early post-lockdown period was 41 % lower compared to the benchmark seasons.

During late post-lockdown period, match injury incidence (RR 0.72; 95 % CI 0.60 to 0.88; $P = 0.0010$) and match injury burden (RR 0.69; 95 % CI 0.67 to 0.72; $P < 0.001$) were lower than the benchmark seasons. In contrast, both overall (RR 1.30; 95 % CI 1.26 to 1.33; $P < 0.001$) and training injury burden (RR 1.65; 95 % CI 1.59 to 1.72; $P < 0.001$) were greater than the benchmark seasons. Training to match ratio during late post-lockdown period was 37 % lower compared to the benchmark seasons. Injury pattern by body region, injury type and diagnosis during early post-lockdown period and late post-lockdown period compared to the benchmark periods are presented in Table 2. A significant shift

was observed in the type of injuries post-lockdown, with adductor strains seeing a notable increase.

4. Discussion

This study represents a natural experiment caused by the COVID-19 pandemic, allowing us to investigate the potential effects of sudden, substantial changes in training and match load on injury risk in professional football.

Eighty-four days (~3 months) passed from the last training session completed pre-COVID-19 lockdown to the first team training session post-lockdown. The resumption post-lockdown basically resembled a classic preseason period, but, this time, occurred in the middle of the competitive period. Despite the fact that players were asked to perform individualized home training,^{1,11} this transition period could have led to transiently decreased fitness, which, consequently, could increase injury risk.^{20,21} Contrary to what one could expect, our findings showed that the COVID-19 lockdown period did not increase injury risk; indeed, no differences were found in overall-, training- or match-injury incidence between the post-COVID-19 lockdown period and the aggregate of the preceding seasons as a reference.

Similar results were reported by a study on 11 out of 20 teams from LaLiga in Spain, reporting no difference in the overall-injury incidence between the pre-lockdown and the post-lockdown competitive periods.²² A smaller, retrospective study from the Norwegian professional first league, comparing 2020 with 2019, also reported no differences in match-injury incidence or burden.¹⁰ Despite the relatively small number of reported injuries, these results have recently been confirmed by the largest study so far, the UEFA Elite Club injury Study,⁴ with a sample of 19 teams. This followed a similar approach as our methodology by comparing three distinct time periods of 2020 with the aggregate values of the five preceding years 2015 to 2019.⁴ Using a retrospective national injury registry from the German Bundesliga, Krutch et al.³ also reported that match incidence did not increase, comparing injury data from the 9 matches of the restart 2019/20 period and the rates after previous summer or winter breaks. Furthermore, the latter study showed that the match-injury rate was significantly lower than the previous season finals (9 last match days).³ This finding was also supported by a study from the French professional leagues (Leagues 1 and 2), where data were recorded prospectively in a national injury database by each club's physician.⁹ Finally, Orhant et al.⁹ investigated time-loss injury occurrence and patterns between the first season (2020/21) completed during the COVID-19 pandemic (longer pre-season following cancelation of the 2019/20 season but shorter season duration) and a regular season (2018/19). Their findings showed a lower match-injury incidence post-COVID-19 lockdown (2020/21) than their reference season (2018/19), especially for League-1 teams.

In contrast, some studies have shown a negative impact of COVID-19 lockdown on injury risk. Even though the study of Krutsch et al.³ showed no effect of COVID-19 lockdown, another study from the

Table 1
Injury count, days lost and exposure over the four seasons.

	Injury count (Days lost)				Exposure (h)		
	Overall injuries	Training injuries	Match injuries	Gradual onset injuries	Total	Training	Match
2017/18	435 (8417)	210 (3372)	161 (3991)	43 (597)	75,356	66,804	8552
2018/19	441 (10685)	193 (4200)	145 (5072)	70 (774)	86,906	79,542	7364
2019/20	385 (8325)	150 (2853)	142 (3818)	63 (888)	52,390	45,964	6426
Early post-lockdown period	84 (1244)	41 (590)	22 (312)	16 (235)	15,188	13,390	1798
Late post-lockdown period	382 (9742)	161 (4003)	141 (3803)	47 (1374)	55,481	46,304	9177

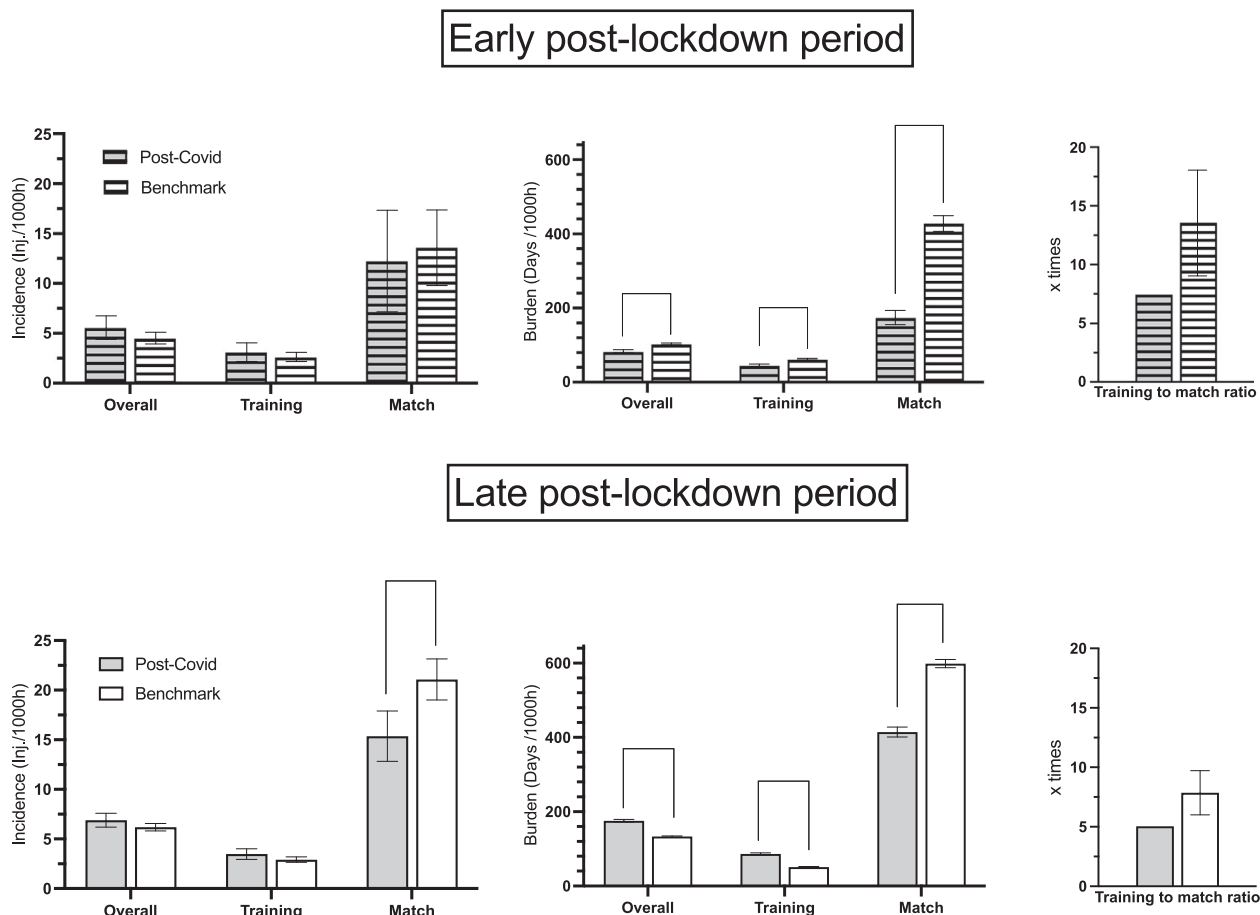


Fig. 2. Incidence, burden and training to match ratio comparisons between post-COVID and benchmark (the average of the seasons prior COVID) scores. Error bars for incidence and burden are represented by the 95 %CI. Error bars for the training to match ratio are represented by standard deviation of the mean.

German league, but using a different approach, found a contradictory outcome. It showed that players had 1.13 times the odds of being injured following the COVID-19 lockdown, with a 3.12 times higher rate of injury when controlling for games played compared to injury rates pre-lockdown.⁸ The reason for this apparent contradiction, based on data from the same league, is unclear, as there is not enough methodological details to help interpretation. On the other hand, a study from

the British Premier League reported higher absolute numbers of muscular and ligamentous injuries in 2020/21 (post-COVID-19) compared with the two preceding seasons (2018/19 and 2019/20).²³

Although most of the studies have focused on match injuries, the results have varied, probably due to methodological differences in study conception and data analysis. As mentioned above, the UEFA Elite club injury study⁴ was the only study using the same methodology and

Table 2
Count and percentage of injuries by body region, injury type and diagnosis.

	Benchmark early post-lockdown period	Early post-lockdown period	Benchmark late post-lockdown period	Late post-lockdown period
Head & neck	18 (2.5 %)	2 (1.7 %)	91 (2.4 %)	21 (3.5 %)
Shoulder	14 (1.9 %)	3 (2.5 %)	85 (2.2 %)	11 (1.8 %)
Elbow & arm	3 (0.4 %)	-	20 (0.5 %)	1 (0.2 %)
Hand	10 (1.4 %)	5 (4.2 %)	55 (1.5 %)	13 (2.2 %)
Low back	27 (3.7 %)	6 (5.0 %)	172 (4.5 %)	19 (3.2 %)
Hip & groin	103 (14.0 %)	11 (9.2 %)	457 (12.0 %)	55 (9.2 %)
Proximal adductor strain	56 (7.6 %)	3 (2.5 %)	247 (6.5 %)	30 (5.0 %)
Thigh	251 (34.1 %)	41 (34.2 %)	1229 (32.3 %)	234 (39.2 %)
Adductor strain	34 (4.6 %)	12 (10.0 %)	153 (4.0 %)	48 (8.0 %)
Hamstring strain	124 (16.9 %)	20 (16.7 %)	684 (18.0 %)	133 (22.3 %)
Quadriceps strain	67 (9.1 %)	6 (5.0 %)	225 (5.9 %)	44 (7.4 %)
Knee	114 (15.5 %)	15 (12.5 %)	564 (14.8 %)	89 (14.9 %)
ACL tear	20 (2.7 %)	-	57 (1.5 %)	15 (2.5 %)
Lower leg	61 (8.3 %)	10 (8.3 %)	382 (10.0 %)	53 (8.9 %)
Muscle strain	41 (5.6 %)	8 (6.7 %)	294 (7.7 %)	42 (7.0 %)
Ankle	93 (12.6 %)	23 (19.2 %)	551 (14.5 %)	67 (11.2 %)
Lateral ligament sprain	41 (5.6 %)	12 (10.0 %)	197 (5.2 %)	25 (4.2 %)
Foot	33 (4.5 %)	4 (3.3 %)	133 (3.5 %)	30 (5.0 %)
p value	0.942		0.005	

Apart from ACL tear, only subgroups with a proportion superior to 5 % are included in the table.

approach as ours; they analyzed match and training injuries separately, adjusting for exposure, and reported on injury burden, not just incidence. Interestingly, while we observed a lower burden for overall-, training- and match-injuries during the short-term post-COVID-19 period compared to the benchmark, the UEFA study researchers identified an increased incidence and burden in training-injuries immediately after the lockdown in April 2020. These scores remained elevated for the rest of the 2019/20 season, and were also higher compared to the historical data from 2015 to 2019.⁴ To explain these results the researchers speculated that (i) the lockdown period was an opportunity for medical teams to rest and treat injured players having suffered long-standing overuse-related injuries, and (ii) the restarting period was characterized by more match-like training protocols with no particular pressure as the resumption of matches was uncertain. The main difference between our study and UEFA Elite club injury study is that our teams played under the same national association and followed the same COVID protocols, while the UEFA study included teams representing several different football associations/countries following different COVID restriction rules and timings. The reasons behind the decrease we observed in injury burden are not known, but this might be due to the exceptional opportunity to allow full rehabilitation of injured players during and after the lockdown and/or the subsequent change in the rules allowing five substitutions per game instead of three.

The start of the new season, the 2020/21 season, occurred only seven days after the previous season ending, therefore teams had to keep training to prepare for the next game. As the break was too short for any substantial recovery effects, we expected an increase in injury risk. Our results showed a higher overall- and training-injury burden, but a lower match-injury burden compared to the benchmark. A potential reason could be that, during this period, the players were exposed to a high frequency of matches, as the training to match ratio was 37 % lower than the benchmark. The UEFA elite club injury study is the only study having investigated the long-term effect of the COVID lockdown on the injury risk during the post-COVID-19 lockdown season (2020/21). It included only the first 3 or 4 months post-COVID-19 lockdown.⁴ The results showed no difference in training or match injury incidence and burden after the restart of the 2020/21 season compared to the five previous seasons as benchmark. The distinction between our findings and the UEFA study could be explained by the short season break (seven days), while the European teams had much longer time to rest and prepare for the start of the 2020/21 season.⁴

During both post-COVID period-1 and -2, there was no substantial differences in injury pattern (body region, injury type and diagnosis). The exception was adductor strains, with a two-fold increase in incidence during both post-COVID periods compared to the benchmark. In contrast, in both the UEFA and French league study, there was no increase in muscle injuries, including hamstring strain injuries.^{4,9}

Our study is based on a prospectively designed injury surveillance program that has been running for more than 8 seasons for the same 12 reported teams.^{12,13,24–26} Data have been collected and managed by the same scientists, adhering to international consensus methodology.¹⁹ We also report training and match injuries, as well as individual player exposure, separately. Using the average of the three preceding seasons as benchmark represents a robust statistical model that considers interseason variations, although there were no major differences in the trend of injuries and exposure during the three benchmark seasons. Some limitations should be kept in mind when interpreting the data. First, during the COVID lockdown, we could not collect individual data during home training. Second, the study has been performed on a sample of professional players from the Qatari premier league. Indeed, regional differences in injury characteristics have been reported (e.g., between Europe and Asia).^{16,27} Third, to allow resumption of the football league, the team medical staff were busy implementing COVID-19 prevention protocols in their team (players and supporting staff represent groups of 45 to 60 people per team). Therefore, the injury data collection may have suffered with some delay in

reporting. A further limitation of this study is that we did not conduct analyses comparing injury incidence/burden between players infected with COVID-19 and those not infected.²⁸

Immediately after the activity suspension due to the COVID-19 lockdown, there was (i) no change in injury incidence and (ii) a lower injury burden than the benchmark. After a rapid return to the successive season after only 7 days of inter-season break, we observed a higher overall and training injury burden, but a lower match injury burden compared to the benchmark. Therefore, the change in training and match schedules should be considered carefully by the medical team but also further research should be done on this matter to capture the best approach to this issue.

Credit authorship contribution statement

MT, RB, YOC and KC conceived the study, and all authors participated in study design.

MT, RB, YOC and MT collected the data. MT performed data analyses, and all authors interpreted the findings. MT, RB, and KC drafted a manuscript skeleton, MT, RB, KA and KC drafted the methods, MT and RB drafted the results and tables/figures, and MT, RB, YOC and KC drafted the discussion. Following the first draft, all authors co-wrote and revised the manuscript for intellectual content.

All authors provided their final approval before manuscript submission. All authors read and approved the final manuscript.

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Confirmation of Ethical Compliance

IRM MoPH Registration: SCH-ADL-070 According to the IRB approved research protocol (ADLQ-IRB: E2017000252).

Declaration of Interest Statement

The authors—Karim Chamari, Yorck Olaf Schumacher, Mokhtar Chaabane, Raouf Nader Rekik1, Souhail Chebbi, Ramadan Daoud, Lena Kristin Bache-Mathiesen, Khalid Alkhelaifi, Roald Bahr, Montassar Tabben—declare that they have no competing interests.

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