

RESEARCH ARTICLE

Prevalence of golf-related injuries among recreational golfers: A preliminary finding

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Abstract:

Despite knowing that golf is a non-contact sport, injury can be a nightmare for its enthusiast. Golf is a game that can be played professionally or as a hobby or for recreational purposes. Although golf is played by many peoples in this country, however, there is few of studies to determine golf-related injuries, especially among recreational golfers. Hence, the objective of the study was to investigate the prevalence of golf-related and type of injuries among recreational golfers. An online retrospective cross-sectional study was done among 327 respondents in collaboration with various golf clubs in Malacca. The inclusion criteria for this study were an active recreational golfer that playing golf for more than a year, and age 18 years old and above. Meanwhile, the study excludes those golfers that are currently having a musculoskeletal disease such as osteoarthritis and rheumatoid arthritis. Data were analysed by using SPSS 22.0 and descriptively described by using frequency. A Pearson's Chi-Square test was used to analyze the relationships between variables of study. The results show that the prevalence of injury was 44.3%. Meanwhile, the most common injuries were the upper limbs (31.1%), back and abdomen (27.9%), and lower limbs (21.3%). The results revealed that age was statistically significant with that of golf injuries (p-value =0.04). In conclusion, as a non-contact sport, and as in any sports or game, injury is the most feared enemy, and golf is not spared. Further study is warranted among professional golfers to establish the effect of injury on their performance.

Keywords: Recreational golfer, golf-related injury, anatomical distribution, types of injury

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1. INTRODUCTION

Golf is known as a popular sport all over the world. Over the years, golf is becoming an increasingly popular game among all ages, abilities, and genders. It is a well-known sport globally, especially in the United States and European countries and Asia, for example, Japan, South Korea, China, Thailand, and Malaysia. It is not only played by professional golfers but also among amateur or recreational as a hobby. Golfers, like those who participate in other sports are also not free from injuries. Even professional golfers who have better training and techniques are facing the risk of injury. Murray et al. (2017) revealed that the risk of injury among amateur golfers had an incidence rate of between 15.8% to 40.9% per year while their lifetime incidence of injury ranged from 25.2% to 67.7%. Among professional golfers, the incidence rates are much higher as compare to the recreational golfers, from 31% to 90% per year and 31% to 88.5% over a lifetime. Approximately 7 in 10 amateurs and 9 in 10 professional

golfers will suffer a golf related injury at least once in a lifetime. Despite being a non-contact sport, the risk of injury is higher among golfers (Dummer et al., 2016) with 60% of professional golfers are likely to get injured compared to the amateur golfers.

Injuries among professional golfers are mostly caused by repetitive movement during training and competing while amateur golfers are caused by poor swing techniques. As the movement is repeatedly made, it increases the pressure on body structures such as muscles, joints, nerves, and tendons. Consequently, this will increase the risk of injuries during golf games. Few reports of injuries exist but increasing awareness of golfing injuries among professional players has raised the attention to these medical conditions. Anatomically, golf-related injuries sustained among recreational golfers are the lower back, elbow, wrist, hand, and shoulder, whereas head, lumbar spine, wrist, and hand injuries are common among professional golfers. Several factors that may increase the risk

of injury include a higher frequency of golfing, age, body mass index (BMI), warm-up habits, incorrect technique, inappropriate equipment, and intensity of training and driving distance. Perron et al. (2016) found that 1.99 incidence of injuries per 1000 hours of playing golf in France affecting the lumbar spine region (21.2%), dominant shoulder (7.8%) and thoracic spine (7.4%). Meanwhile, in the United State during 1990 through 2011, it was reported that 42.2% of golf related injuries at the emergency department were among 18–54 years old (Walsh et al., 2017). However, the rates of injury per 10,000 golfers were highest among individuals at the age of 7–17 years old compared to 18–54 years old. The most frequently injured part of the body was head and neck (36.2%) with the sprain and strain (30.6%) being the most common type of injury. The contributed risk factors were found to be poor swing techniques and overuse of certain body parts (Zouzias et al., 2018). A study by Jee and Lee (2013) found that 41.9% of injury happened at lower back, meanwhile the elbow or wrist was 7%. Insufficient warming up or not doing any warmup was also found to be the factors that cause the injuries (Ehlert & Wilson, 2019). There are many other factors related to the golf injuries such as age, gender, and body mass index (BMI). Besides being injured due to playing golf, other related injuries can also be caused by external factors such as being hit by a stray golf ball, falling from a buggy, and walking on an uneven surface of the golf course. Tung et al. (2000) have been reported that there were three cases of head injuries occurred from golf buggies during the years 1995–1997 and have been treated at the Singapore General Hospital.

While most studies focused on professional golfers (Joeng et al., 2018), there were lack of studies among recreational golfers especially in Malaysia. Thus, this study aims to determine the prevalence and types of injury among recreational golfers in Malacca. This can benefit the golf industries in this country by recognising the importance of injury prevention among golfers.

2. MATERIALS AND METHODS

The design of this study is a retrospectives cross sectional study. The purpose was to investigate the prevalence and types of injury among recreational golfers in Malacca. This study had been conducted at a selected golf clubs in Malacca and convenience sampling was used whereby active recreational golfers were chosen as the target population. Estimated that approximately, 2200 registered golfers in Malacca. By using the sample size table by Krejcie & Morgan (1970), a total of 327 samples were randomly selected (simple random sampling) from the club's membership lists. In collaboration with the respective golf clubs, the questionnaires were emailed to the prospective respondents. Online survey was chosen as face-to-face contact was restricted due to the Movement Control Order during Covid-19 pandemic. The selected respondents were notifying about the survey through their registered email and telephone number with the clubs. Explanation about the study

was done through the participants' information sheet which was emailed together with the questionnaires. A reminder was sent at least thrice to remind the respondents about the study. If no response after the third reminder, the researcher assumed that they are not interested to participate in the study.

A closed-ended questionnaire from previous study by Wan (2012) was adopted to collect the data. The questionnaire consists of 3 main parts named; part A, part B and part C. Part A consists of the background information of the subjects, frequency of golfing, complementary fitness training programs, warm-up habits and perceived injury knowledge. Questions in part B includes the injury information, enquiring information about the injured body location and type of injury, possible causes of injury, treatment and recovery time. In Part C, the demographic data was recorded (gender, age and handicap). Reliability test had been done for the questionnaire with the Cronbach Alpha of 0.705.

The inclusion criteria were recreational golfer aged 18 years old and above and playing golf for more than a year. Golfers with musculoskeletal disease such as osteoarthritis and rheumatoid arthritis or other injury not related to golf were excluded from this study through self-reported method.

Data collection were done from October to March 2021. Research ethical had been obtained from UiTM's Research Ethics Committee (REC/10/2020 (UG/MR/204)). Data was analyzed by using the Statistical Package for the Social Science 22.0 (SPSS 22.0) and statistical analysis such as frequency was performed, and Pearson's Chi-square test used to analyze the relationship between variables of study.

3. RESULTS AND DISCUSSION

Based on the sample size calculation, 327 samples have been determined to take part in this study. However, only a total of 183 recreational golfers took part in this study with a response rate of 55.9%. Table 1 is the demographic data of the respondents. Most of the respondents were male which consists of 146(79.8%) compared to females 37(20.2%). As for age, mostly respondents were between the age of 18–40 years old 120(65.5%). For Body Mass Index (BMI), 116(63.4%) respondents were in normal category followed by 43(23.5%) overweight, 13(7.1%) were obese and 11(6%) were underweight. Meanwhile, the frequency of golfing per week, 63.4% golfing less than 3 hours followed 36.6% more than 3 hours per week.

In Table 2, 102(33.7%) of the respondents claimed that they did not suffer from any golf-related injuries compared to 81(44.3%) of the respondents that had suffered from golf-related injuries. Thus, the prevalence of golf-related injury was 44.3%. About 71(38.8%) respondents were injured while playing at the golf course while 9(4.9%) were injured during practicing at the driving range (Table 3).

Table 1. The demographic data of the respondents.

Variables	Frequency n (%)
Gender	
Male	146 (79.8)
Female	37 (20.2)
Age	
18 to 30	57 (31.1)
31 to 40	63 (34.4)
41 to 50	34 (18.6)
51 to 60	19 (10.4)
Above 60	10 (5.5)
Body Mass Index (BMI)	
Below 18.5	11 (6)
18.5 to 24.9	116 (63.4)
25 to 29.9	43 (23.5)
30 or greater	13 (7.1)
Frequency of golfing in hours per week	
Less than 1 hour	40 (21.9)
1 to 3 hours	76 (41.5)
4 to 6 hours	36 (19.7)
7 to 9 hours	7 (3.8)
More than 9 hours	24 (13.1)

Table 2. Suffer from golf- related injuries.

Variables	Frequency n (%)
Yes	81 (44.3)
No	102 (55.7)
Total	183 (100)

Table 3. The location of injury occurred

Place of injury occurred	Frequency n (%)
Driving range	9 (4.9)
Golf course	71 (38.8)
No injury	103 (56.3)
Total	183 (100)

The type of injuries suffered by the recreational golfers were categorized into four groups which consist of: 1) head and eye contusion, 2) upper limb injuries, 3) back and abdomen injuries, as well as 4) lower limb injuries. It was reported that some golfers experiencing more than two (2) types of injuries at one time. Among the four types, it shows that the upper limbs and, back and abdomen were the most common injuries with 57(31.1%) and 51(27.9%) respectively. Then followed by others which were lower limbs injuries with 39(21.3%) and, head and eye contusion with 3(1.6%).

Table 4. Types of injuries.

Types	Frequency n (%)
Upper limb injuries	57 (31.1)
Back and abdomen injuries	51 (27.9)
Lower limb injuries	39 (21.3)
Head and eye contusion	3 (1.6)

For the anatomical region of injuries in Table 5, a total of 43(23.5%) suffered from lower back strain, wrist sprain with 32(17.5%), while shoulder muscle strain 23(12.6%). Meanwhile, 16(8.7%) of the respondents suffered from shoulder sprain followed by ankle sprain with 14(7.7%). Surprisingly, only 13(7.1%) of the respondents experiencing golfer's elbow and forearm muscle strain, which reckoned as one of the injuries in golf. It was found that a lower number of golfers experiencing serious injury such, as hamstring strain 12(6.6%), from knee sprain 11(6.0%), and calf strain 8(4.4%).

Table 5. Anatomical region of injuries.

Anatomical region of injuries	Frequency n (%)
Head contusion	1(0.5)
Eye contusion	1(0.5)
Shoulder sprain	16(8.7)
Shoulder dislocates	4(2.2)
Shoulder muscle strain	23(12.6)
Elbow contusion	1(0.5)
Golfer's elbow	13(7.1)
Forearm muscle strain	13(7.1)
Wrist sprain	32(17.5)
Wrists dislocate	1(0.5)
Wrist chronic & overuse pain	1(0.5)
Lower back strain	43(23.5)
Lower back vertebral subluxation	6(3.3)
Lower back chronic & overuse pain	5(2.7)
Abdomen muscle strain	3(1.6)
Knee sprain	11(6.0)
Ankle sprain	14(7.7)
Ankle fracture	2(1.1)
Plantar fasciitis	2(1.1)
Quadricep strain	5(2.7)
Hamstring strain	12(6.6)
Calf strain	8(4.4)

When asked about the possible factors of injury, lack of warming-up prior to playing golf (38.3%) and inappropriate swing technique (36.1%) recording the highest results (Table 6). Having underlying disease such as osteoarthritis, frozen shoulder and degenerative of spin as the third most common factors of golf-related injuries with 24.6%. Meanwhile, 38 (20.8%) said it is because of the repetitive movement of the

specific body part such as shoulder, elbow, and lower back, and 26(14.2%) for tiredness.

Table 6. Factors of golf-related injuries.

Factors of golf-related injuries	Frequency n (%)
Not enough warm up	70 (38.3)
Poor body condition	45 (24.6)
Overuse of specific body part	38 (20.8)
Tiredness	26 (14.2)
Inappropriate swing technique	66 (36.1)
Venue	2 (1.1)
Other's negligence	2 (1.1)
Improper equipment	8 (4.4)
Others	5 (2.7)

Table 7 shows the relationship between age, BMI and frequency of golfing with golf-related injuries. The results revealed that age was statistically significant with that of golf injuries (p-value =0.04). Meanwhile, the frequency of golfing and BMI statistically are not significant.

Table 7. Relationship between age, BMI and frequency of golfing with frequency of golf-related injury.

Variables	Injury (n=81) n (%)	No injury (n=102) n (%)	P value
Age			
18 to 30	19(23.5)	38(37.3)	0.040
31 to 40	36(44.4)	27(42.9)	
41 to 50	11(13.6)	23(22.5)	
51 to 60	9(11.1)	10(9.8)	
Above 60	6(7.4)	4 (3.9)	
Frequency of golfing			
Less than 3 hours	52 (64.2)	64 (62.7)	0.078
4 to 9 hours	23 (28.4)	20 (19.6)	
More than 9 hours	6 (7.4)	18 (17.6)	
Body Mass Index			
Below 18.5	4(4.9)	7(6.9)	0.395
18.5 to 24.9	54 (66.7)	62 (60.8)	
25 to 29.9	20 (24.7)	23 (22.5)	
30 or greater	3 (3.7)	10 (9.8)	

Pearson's Chi-Square

Even though golf is non-contact sports, injury can happen due to certain factors such as swing technique, lack of physical readiness, and so on. Based on the results, the authors found that the prevalence of injury is quite low and mostly golfers were likely to get injured while playing at the golf course. Previous studies had shown similar results in which less than 50% of golfers had suffered from injuries, and frequency of

golf-related injuries was not associated with the frequency of golfing. The lower rate of injuries among amateur or recreational golfers was due to lower frequency of golfing and training as compared to professional golfers which spent more time practicing and competing on the golf course (Gosheger et al., 2003; McHardy et al., 2007). With proper and observing the rules of the game, injury can be avoided even if the frequency of golfing is frequent (Jee and Lee, 2013).

As in other study ((Joeng et al., 2018) this study found that upper limbs were the most common related golf injuries followed by back and abdomen, and lower limbs. The least common golf-related injuries were head and eye contusion. Golf was categorized as overhead sports as it involved the upper limbs to swing the golf clubs. The overuse and repetitive movement of upper limbs during playing golf can increase the rate of golf-related injuries. Tooth et al. (2020) mentioned that the frequency of playing was one of the factors that lead to the upper limb injuries in overhead sports. The specific body parts that were involved were shoulder/clavicle as the common site of injury, followed by wrist, lumbar spine/lower back, ankle, neck /cervical spine, and knee. Robinson et al. (2019) also mentioned that the most common injuries among amateur golfers were elbow, shoulder, and lumbar spine.

However, the most specific anatomical region injuries sustained in this study were lower back strain, followed by wrist sprain and shoulder muscle strain. Jee and Lee (2013) similarly found that lower back was the most common anatomical region injury and followed by elbow or wrist and others which correlates with this study. Meanwhile, Lindsay and Vandervoort (2014) found that lower back was the most common musculoskeletal injuries in both amateur and professional golfers. The reason behind this was due to the force on the spine during golf swing technique. Golf swing technique involved the rotation of the trunk toward the opposite side of the body. The aggressive swing can produce repetitive insufficient force to the spine and will cause lower back injury. Walker et al. (2019) mentioned that repetitive movement of the trunk rotation can cause lower back injury and may lead to the degenerative of the spine. This problem mostly experienced by the amateur or recreational golfers were the lower back muscles imbalance and fatigue (Finn, 2013). Muscle's imbalance and fatigue might contribute to the risk of spinal muscle tears and strains.

There were several demographic factors that may lead to the golf-related injuries. This study found that age was related to the golf-related injuries. Similar to Smith et al. (2018) found that age had its association with the golf-related injuries. A study by Baker et al. (2017) mentioned that risk of injuries in golf were higher among older golfers because they might easily fatigue over the course of the game (Zouzias et al., 2018). Senior golfers that involved in golf, injuries were related to the aging and external factors (Cann et al., 2005). Aging factors such as reduce in muscle strength, reduce in bone density, reduce flexibility of connective tissue, reduction of the

lubrication of the joint and reduce in sensory can be the confounding factors of injury. External factors such as tripping and falling on uneven surface can also cause injuries among older golfers (Baker et al., 2017). Body Mass Index (BMI) was found to be did not associated with the frequency of golf injuries. The results were contradicting to the previous study by Smith et al. (2018) which they found the relationship between BMI and frequency of golf injuries specifically on the lower back injuries among recreational golfers. In short, low back pain among recreational golfers might be related to the increase load on spine and also the fat distribution on body (Chou et al., 2016). The fat was concentrated around the abdomen which may result in a strong impact on the lumbar spine and will develop lower back pain. Meanwhile, a study by Joeng et al. (2018) found that BMI was significantly associated with the golf injuries among professional golfers. However, some professional golfers aimed to build up their muscles strength by increasing the body weight which can increase their driving distance. Muscles strength was one of the factors that can improve golf performance especially in driving distance (Torres-Ronda et al., 2011). According to the previous study by ten Hoor et al. (2018), they found that individuals with higher BMI were better in strength compared to the normal BMI.

This study has its limitations. The authors acknowledged that the number of samples were small due to the difficulties of using online survey methods especially in encouraging the selected respondents to participating in the study. It could be suggested that the targeted samples felt inconvenience with receiving unsolicited email. Face-to-face interview might be able to increase the numbers of respondents. Further study is warranted to determine the causes or risk factors of golf-related injury among golfers.

4. CONCLUSION

In conclusion, as a non-contact sport, golf is largely a popular game being played by many all over the world. As in any sports or games, injury is the most feared enemy and golf are not spared especially among the professional golfers. Thus, the related professional golf association can play an important role to create an awareness of golf injuries among the golfers. As for the sport medicine professionals which includes sport medicine doctor, physical therapist, massage therapist, chiropractor and others can play their part towards treating and help with golf injury's recovery. The personal trainer can also help to train the golfers about the trick of the game to prevent injury which can be related to the internal or external factors.

REFERENCES

- Baker, M. L., Epari, D. R., Lorenzetti, S., Sayers, M., Boutellier, U., & Taylor, W. R. (2017). Risk Factors for Knee Injury in Golf: A Systematic Review. *Sports Medicine*, 47(12), 2621–2639. <https://doi.org/10.1007/s40279-017-0780-5>
- Cann, A. P., Vandervoort, A. A., & Lindsay, D. M. (2005). Optimizing the benefits versus risks of golf participation by older people. *Journal of Geriatric Physical Therapy* (2001), 28(3), 85–92. <https://doi.org/10.1519/00139143-200512000-00004>
- Chou, L., Brady, S. R. E., Urquhart, D. M., Teichtahl, A. J., Cicuttini, F. M., Pasco, J. A., Brennan-Olsen, S. L., & Wluka, A. E. (2016). The Association between Obesity and Low Back Pain and Disability Is Affected by Mood Disorders. *Medicine (United States)*, 95(15), 1–7. <https://doi.org/10.1097/MD.00000000000003367>
- Cohn, M. A., Lee, S. K., & Strauss, E. J. (2013). Upper extremity golf injuries. *Bulletin of the Hospital for Joint Disease* (2013), 71(1), 32–38. <http://www.ncbi.nlm.nih.gov/pubmed/24032581>
- Dummer, G., Tucker, C. J., & Heller, H. (2016). *INJURIES*.
- Ehlert, A., & Wilson, P. B. (2019). A systematic review of golf warm-ups: Behaviors, injury, and performance. *Journal of Strength and Conditioning Research*, 33(12), 3444–3462. <https://doi.org/10.1519/jsc.00000000000003329>
- Finn, C. (2013). Rehabilitation of Low Back Pain in Golfers: From Diagnosis to Return to Sport. *Sports Health*, 5(4), 313–319. <https://doi.org/10.1177/1941738113479893>
- Gosheger, G., Liem, D., Ludwig, K., Greshake, O., & Winkelmann, W. (2003). Injuries and overuse syndromes in Golf. *The American Journal of Sports Medicine*, 31(3), 438–443. <https://doi.org/10.1055/s-0031-1277207>
- Jee, Y.-S., & Lee, H.-J. (2013). Golf and Injury Incidence in Recreational Golfers: A Retrospective Study. *Article in Journal of Convergence Information Technology*, July. <https://www.researchgate.net/publication/263698350>
- Joeng, H. S., Na, Y. M., Lee, S. Y., & Cho, Y. J. (2018). Injuries among korean female professional golfers: A prospective study. *Journal of Sports Science and Medicine*, 17(3), 492–500.
- Krejcie, R. V., & Morgan, D. (1970). Small-Sample Techniques. *The NEA Research Bulletin*, 30, 607–610.
- Lindsay, D. M., & Vandervoort, A. A. (2014). Golf-related low back pain: A review of causative factors and prevention strategies. *Asian Journal of Sports Medicine*, 5(4). <https://doi.org/10.5812/asjsm.24289>
- McHardy, A. J., Pollard, H. P., & Luo, K. (2007). Golf-related lower back injuries: an epidemiological survey. *Journal of Chiropractic Medicine*, 6(1), 20–26. <https://doi.org/10.1016/j.jcme.2007.02.010>
- Murray, A. D., Daines, L., Archibald, D., Hawkes, R. A., Schiphorst, C., Kelly, P., Grant, L., & Mutrie, N. (2017). The relationships between golf and health: A scoping review. *British Journal of Sports Medicine*, 51(1), 12–19. <https://doi.org/10.1136/bjsports-2016-096625>
- Perron, C., Rouillon, O., & Edouard, P. (2016). Epidemiological study on injuries and risk factors for injuries in the amateur golfer French high-level. *Annals of Physical and Rehabilitation Medicine*, 59, e20. <https://doi.org/10.1016/j.rehab.2016.07.048>
- Robinson, P. G., Murray, I. R., Duckworth, A. D., Hawkes, R., Glover, D., Tilley, N. R., Hillman, R., Oliver, C. W., & Murray, A. D. (2019). Systematic review of musculoskeletal injuries in professional golfers. *British Journal of Sports Medicine*, 53(1), 13–18. <https://doi.org/10.1136/bjsports-2018-099572>

- Smith, J. A., Hawkins, A., Grant-Beuttler, M., Beuttler, R., & Lee, S. P. (2018). Risk Factors Associated With Low Back Pain in Golfers: A Systematic Review and Meta-analysis. *Sports Health*, 10(6), 538–546. <https://doi.org/10.1177/1941738118795425>
- ten Hoor, G. A., Plasqui, G., Schols, A. M. W. J., & Kok, G. (2018). A Benefit of Being Heavier Is Being Strong: a Cross-Sectional Study in Young Adults. *Sports Medicine - Open*, 4(1). <https://doi.org/10.1186/s40798-018-0125-4>
- Tooth, C., Gofflot, A., Schwartz, C., Croisier, J. L., Beaudart, C., Bruyère, O., & Forthomme, B. (2020). Risk Factors of Overuse Shoulder Injuries in Overhead Athletes: A Systematic Review. *Sports Health*, 12(5), 478–487. <https://doi.org/10.1177/1941738120931764>
- Torres-Ronda, L., Sánchez-Medina, L., & González-Badillo, J. J. (2011). Muscle strength and golf performance: A critical review. *Journal of Sports Science and Medicine*, 10(1), 9–18.
- Tung, M. Y. Y., Hong, A., & Chan, C. (2000). Golf buggy related head injuries. *Singapore Medical Journal*, 41(10), 504–505.
- Walker, C. T., Uribe, J. S., & Randall, W. (2019). Broca's area. 31(December), 914–917.
- Walsh, B. A., Chounthirath, T., Friedenber, L., & Smith, G. A. (2017). Golf-related injuries treated in United States emergency departments. *American Journal of Emergency Medicine*, 35(11), 1666–1671. <https://doi.org/10.1016/j.ajem.2017.05.035>
- Wan, S. M. (2012). *The Injury Patterns Of Hong Kong Amateur Golfers*.
- Zouzias, I. C., Hendra, J., Stodelle, J., & Limpisvasti, O. (2018). Golf Injuries: Epidemiology, Pathophysiology, and Treatment. *Journal of the American Academy of Orthopaedic Surgeons*, 26(4), 116–123. <https://doi.org/10.5435/JAAOS-D-15-00433>