ORIGINAL RESEARCH PAPER

Orthopaedics

POPULATION- LEVEL ASSESSMENT OF DUPUYTRENS CONTRACTURE AMONG PATIENTS WITH ALCOHOL-RELATED DISEASE COMPARED WITH DIABETES MELLITUS

KEY WORDS: Dupuytren's contracture; Palmar fibromatosis; Hand deformity; Diabetes mellitus; Alcohol-related disease

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ABSTRACT

Background: Dupuytren's contracture (DC) is a chronic, progressive fibroproliferative disorder of the palmar fascia that leads to flexion deformities of the fingers and functional impairment of the hand. The condition has been consistently associated with several systemic comorbidities, most notably diabetes mellitus and alcohol-related disease. Although both conditions are recognized risk factors for the development of DC, the extent to which each contributes to disease incidence and prevalence remains incompletely understood. Comparative population-level data directly evaluating the relative impact of diabetes mellitus and alcohol-related disease on the development of Dupuytren's contracture are limited, highlighting the need for further epidemiological investigation. **Materials And Methods:** A retrospective cohort study was performed using data from the TriNetX Global Collaborative Network, a federated research platform comprising over 148 million de-identified patient records from 139 healthcare organizations worldwide, spanning the period from December 10, 2004, to December 10, 2024. Two mutually exclusive cohorts were established: patients diagnosed with alcohol-related disorders (n = 2,484,432), excluding those with a diagnosis of diabetes mellitus, and patients with diabetes mellitus (n = 9,435,596), excluding those with alcohol-related disorders. To minimize confounding, 1:1 propensity score matching was conducted based on age, sex, race, and the presence of epilepsy and psoriasis. This process yielded two well-balanced cohorts comprising 2,138,531 patients each. The primary outcome was the incidence of Dupuytren's contracture, identified using the International Classification of Diseases, Tenth Revision (ICD-10) code M72.0, assessed over a follow-up period of up to 20 years. **Results:** The occurrence of Dupuytren's contracture was nearly equivalent in both study groups, with an incidence of 0.264% among individuals with alcohol-related disorders and 0.275% among those with diabetes mellitus. Statistical comparison indicated a marginally reduced likelihood of DC in the alcohol-related disease cohort, reflected by a risk ratio of 0.962 (95% CI: 0.927–0.997; $p = 0.035$) and a corresponding odds ratio of 0.961. Time-to-event analysis using Kaplan–Meier curves demonstrated that patients with diabetes mellitus developed Dupuytren's contracture significantly earlier than those with alcohol-related disease (hazard ratio = 1.258; $p < 0.001$). In contrast, the alcohol-related disease cohort showed a significantly greater tendency toward recurrent diagnoses of Dupuytren's contracture over the follow-up period ($p < 0.001$). **Conclusion:** While the absolute incidence of Dupuytren's contracture was low in both cohorts, diabetes mellitus was associated with an earlier manifestation of the disease, whereas alcohol-related disorders were linked to a higher likelihood of recurrence. These divergent clinical patterns suggest the presence of distinct underlying pathophysiological mechanisms in each population. The findings underscore the importance of tailored screening approaches and individualized management strategies for patients with these systemic conditions. Future studies should focus on identifying modifiable risk factors and elucidating the molecular and biological pathways involved, with the aim of improving preventive strategies and optimizing therapeutic interventions.

INTRODUCTION

Dupuytren's contracture (DC) is a slowly progressive fibroproliferative disorder of the hand characterized by pathological changes within the palmar fascia. These changes result in nodular thickening and fibrous cord formation, leading to progressive shortening of the palmar aponeurosis and subsequent flexion deformities of the fingers. The ring and little fingers are most commonly involved. As the disease advances, affected individuals may experience significant limitations in hand function, compromised dexterity, and a reduction in overall quality of life, particularly in severe or bilateral cases.

The distribution of Dupuytren's contracture varies widely across populations and regions. Epidemiological studies have demonstrated a notably higher prevalence among individuals of Northern European ancestry, with lifetime risk estimates in European males reported to be as high as 30%. In the United States, prevalence rates are lower, ranging between 3% and 6% in the general population, but increase substantially with advancing age. The condition exhibits a pronounced male predominance, with reported male-to-female ratios of approximately 3:1, and advancing age-particularly beyond the age of 50 years-has been consistently identified as a major risk factor.

Despite its relatively frequent occurrence in certain demographic groups, Dupuytren's contracture is often overlooked during its initial stages, when symptoms may be mild or asymptomatic. Delayed recognition can allow progression to more advanced deformities, emphasizing the importance of early identification and timely intervention to optimize functional outcomes.

The precise etiology of Dupuytren's contracture (DC) has not yet been fully elucidated; however, both genetic susceptibility and environmental influences are widely recognized as key contributors to disease development. Pathophysiologically, abnormal fibroblast activity and excessive deposition of type III collagen play central roles, leading to the formation of fibrotic nodules and cords within the palmar fascia. Increasing evidence suggests that systemic disorders, particularly diabetes mellitus and alcohol-related disease, are important contributors to the onset and

progression of DC. In individuals with diabetes, the accumulation of advanced glycation end products is believed to modify collagen architecture and disrupt normal fibroblast function, thereby promoting fibrotic changes. Likewise, chronic alcohol exposure has been associated with microvascular compromise and altered fibroblast behavior, mechanisms that may accelerate palmar fascial fibrosis.

Additional conditions, including smoking, epilepsy, and inflammatory disorders such as psoriasis, have also been linked to DC, potentially through shared inflammatory, vascular, or fibrotic pathways. Despite extensive investigation, considerable uncertainty persists regarding the epidemiological and biological relationships between DC and these systemic conditions. Prior studies evaluating the prevalence and risk of DC among patients with diabetes or alcohol-related disorders have reported inconsistent findings, ranging from strong associations to minimal or no correlation. Such variability may be attributable to methodological constraints, including limited sample sizes, inadequate adjustment for confounding variables, and the absence of long-term follow-up.

Moreover, although diabetes mellitus and alcohol-related disease are independently associated with Dupuytren's contracture, their relative contributions and potential interaction effects on disease onset and progression remain poorly defined. Addressing these knowledge gaps requires large-scale, longitudinal investigations with rigorous adjustment for confounders. Accordingly, the present study aims to evaluate the incidence and prevalence of Dupuytren's contracture in patients with alcohol-related disorders compared with those with diabetes mellitus. By leveraging a large, multi-institutional database and employing propensity score matching, this analysis seeks to clarify differential risk patterns between these populations. The findings are intended to enhance understanding of DC pathogenesis, support evidence-based screening strategies, and inform the development of targeted preventive and therapeutic approaches.

Methods

Study Design

This study was designed as a retrospective cohort analysis using data derived from the TriNetX Global Collaborative Network, a large federated research platform incorporating electronic health records from 139 healthcare organizations (HCOs) worldwide. The database provided access to longitudinal, de-identified medical records of 148,972,479 patients. The study period extended over two decades, from December 10, 2004, to December 10, 2024. Individuals aged between 0 and 90 years at the time of cohort entry were eligible for inclusion.

Two distinct cohorts were established for comparative analysis: an alcohol-related disorders cohort and a diabetes mellitus cohort. Patients were assigned to the alcohol-related disorders cohort if they had a documented diagnosis of alcohol-related conditions, including alcohol abuse, alcohol dependence, or other alcohol-induced disorders, as defined by relevant ICD-10 diagnostic codes. The diabetes mellitus cohort comprised patients with a documented diagnosis of diabetes mellitus. To ensure mutually exclusive cohorts, individuals with coexisting diagnoses of both alcohol-related disorders and diabetes mellitus were excluded from the respective comparison groups

Patients with alcohol-related liver disease (ICD-10 code K70) were identified for inclusion in the alcohol-related disorders cohort. Individuals with a documented diagnosis of diabetes mellitus (ICD-10 codes E08–E13) were excluded from this group. After applying the inclusion and exclusion criteria, a total of 2,484,432 patients were included in this cohort.

The diabetes mellitus cohort comprised patients diagnosed with diabetes mellitus (ICD-10 codes E08–E13). To ensure cohort exclusivity, individuals with alcohol-related disorders, including alcohol use disorders (ICD-10 code F10) and alcohol-related liver disease (ICD-10 code K70), were excluded. Following these criteria, 9,435,596 patients were included in the diabetes mellitus cohort.

Data Analysis

To minimize confounding, 1:1 propensity score matching (PSM) was performed using the following covariates: age at index, sex, race, epilepsy, and psoriasis. This matching process yielded well-balanced cohorts of 2,138,531 patients each, thereby ensuring comparability between groups. Following PSM, the alcohol-related disorders cohort was reduced from 2,484,432 to 2,138,531 patients, while the diabetes mellitus cohort was reduced from 9,435,596 to 2,138,531 patients (Figure 1).

The index event was defined as the first recorded diagnosis fulfilling the inclusion criteria for each cohort. Patients were followed for a 20-year period from the index date. The primary outcome was the development of Dupuytren's contracture, identified using ICD-10 code M72.0 (palmar fascial fibromatosis).

All propensity score matching and statistical analyses were conducted using TriNetX analytical tools. Risk estimates, including absolute risk, risk difference, risk ratio, and odds ratio, were calculated to assess the proportion of patients diagnosed with Dupuytren's contracture in each cohort. Time-to-event analysis was performed using Kaplan–Meier survival curves, with comparisons assessed using the log-rank test and hazard ratios to estimate the time to diagnosis. Additionally, frequency analyses were conducted to evaluate the total number of Dupuytren's contracture diagnoses during the study period. Statistical significance was defined as a two-sided p-value < 0.05.

RESULTS

Risk Analysis

A comparative risk analysis was performed to evaluate the incidence of Dupuytren's contracture (DD) between the two matched cohorts (Table 1). The findings are summarized as follows:

Risk difference:
The absolute risk difference between the cohorts was negligible (□0.000), yet statistically significant ($p = 0.035$).

Risk ratio: The risk ratio was 0.962 (95% CI: 0.927–0.997), indicating a marginally reduced risk of developing DD in the alcohol-related disorders cohort compared with the diabetes mellitus cohort.

Odds ratio: Consistent with the risk ratio, the odds ratio was 0.961 (95% CI: 0.927–0.997), further supporting a slightly lower relative likelihood of DD among patients with alcohol-related disorders

Kaplan–Meier Survival Analysis

Kaplan–Meier survival analysis was conducted to compare the time-dependent probability of developing Dupuytren's contracture (DD) between the two cohorts over a 20-year follow-up period (Table 2). The log-rank test demonstrated a statistically significant difference in survival curves between the cohorts ($\chi^2 = 150.820$, $p < 0.001$).

The hazard ratio was 1.258 (95% CI: 1.212–1.305), indicating that patients in the diabetes mellitus cohort experienced a significantly higher and earlier risk of developing DD compared with those in the alcohol-related disorders cohort.

Number of Instances

The frequency of Dupuytren's contracture (DD) diagnoses was compared between the two cohorts (Table 3).

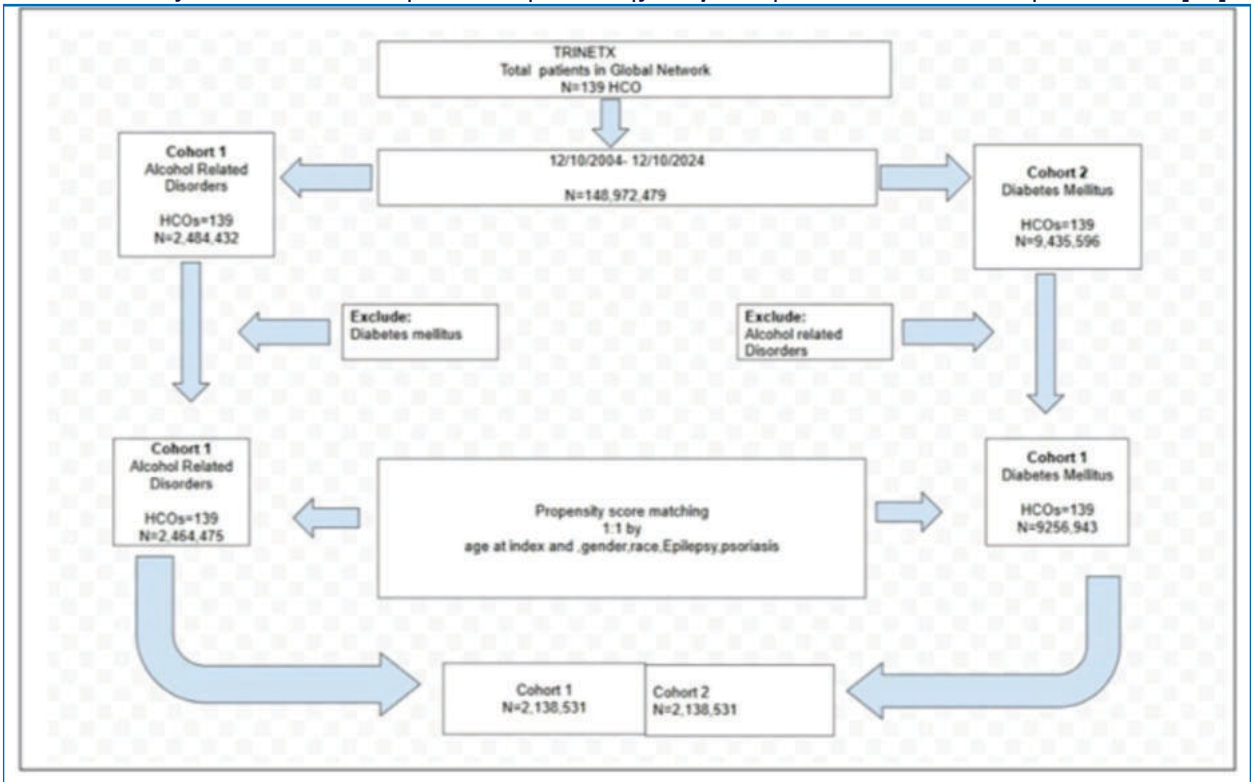

Figure 1: Flow diagram

Table 1: Risk analysis between patients with alcohol related disorders (Cohort 1) and diabetes mellitus (Cohort 2)

Cohort	Patients in cohort	Patients with outcome	Risk	95% CI
Alcohol (cohort 1)	2,138,531	5,645	0.003	
Diabetes (cohort 2)	2,138,531	5,871	0.003	

Table 2: Kaplan-Meier survival analysis comparing the probability of surviving without Dupuytren's Contracture

Cohort	Patients in cohort	Patients with outcome	Median survival (days)	Survival probability at end of time window
Alcohol (cohort 1)	2,138,531	5,645	–	98.43%
Diabetes (cohort 2)	2,138,531	5,871	–	98.08%

Table 3: Number of instances of Dupuytren's Contracture among patients with alcohol related disorders (Cohort 1) and diabetes mellitus (Cohort 2)

Cohort	Patients in cohort	Patients with outcome	Mean	Standard deviation	Median	t	df	p
Alcohol (cohort 1)	2,138,531	5,645	4.089	8.554	2	3.912	11514	0.000
Diabetes (cohort 2)	2,138,531	5,871	3.491	7.840	1			

T-Test Analysis

A two-sample t-test demonstrated a statistically significant difference in the number of DD instances between the cohorts ($t = 3.912, p < 0.001$). This finding indicates that patients in the alcohol-related disorders cohort experienced a higher number of DD diagnostic instances compared with those in the diabetes mellitus cohort.

DISCUSSION

This study evaluates the incidence and longitudinal outcomes of Dupuytren's contracture over a 20-year period (December 10, 2004 to December 10, 2024) in two well-defined high-risk populations: patients with alcohol-related disorders and those with diabetes mellitus. Utilizing data derived from the TriNetX Global Collaborative Network, and applying robust propensity score matching alongside advanced statistical methodologies, this analysis provides a comprehensive and methodologically rigorous assessment of the comparative risk and temporal patterns of Dupuytren's contracture between these cohorts

Limitations

Despite the use of propensity score matching to reduce confounding, the possibility of residual confounding cannot be entirely eliminated. Additionally, variations in diagnostic accuracy over the 20-year study period, coupled with evolving clinical practices, diagnostic criteria, and follow-up protocols, may have influenced case identification and outcome ascertainment. These temporal changes should be considered when interpreting the study findings.

CONCLUSION

This 20-year study elucidates the complex relationship between Dupuytren's contracture and two distinct yet high in these high-risk populations—patients with alcohol-related diseases and those with diabetes mellitus—the overall incidence of Dupuytren's contracture was comparably low. However, diabetes mellitus was associated with an earlier onset of disease, as demonstrated by a higher hazard ratio on survival analysis. Conversely, alcohol-related diseases were associated with a greater frequency of recurrent episodes, suggesting distinct patterns of disease progression or differences in healthcare utilization between the two groups.

These observations underscore the importance of adopting individualized approaches to screening, prevention, and clinical management that are tailored to the unique pathophysiological and clinical profiles of each population. Further research aimed at elucidating the underlying mechanisms and developing targeted therapeutic strategies is necessary to improve outcomes among these at-risk cohorts.

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This study received no external funding.

Conflict Of Interest
The authors declare no conflicts of interest.

Ethical Approval
Ethical approval was not required for this study.

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