Evaluation and Intervention of Quality of life in individuals with Diabetic Peripheral Neuropathy: A Quantitative Cross-sectional Content Analysis

KUMAR SENTHIL P., MPT*; ADHIKARI PRABHA, MD; JEGANATHAN, PS, PHD***; D'SOUZA MARIELLA, MPHIL****; D'SOUZA SYDNEY C., MD**; MISRI Z.K., DM (NEUROLOGY)*****

*Founder-President, Academy of Orthopaedic Manual Physical Therapists (AOMPT)™, Freelancer Physiotherapist and private practitioner, Mangalore, India; **Professor, Department of Medicine; ***Professor, Department of Physiology; ****Selection Grade Lecturer, Department of Psychiatry; *****Associate Professor, Department of Neurology; Kasturba Medical College (Manipal University), Mangalore, India.

Abstract

Background: Foot and ankle dysfunction secondary to peripheral nerve damage is the most common microvascular complication in individuals with diabetes mellitus.

Purpose: This study aimed to perform a systematic review and quantitative content analysis of articles emphasizing Quality of life (QoL) in people with Diabetic peripheral neuropathic pain (DPNP) and Painful diabetic peripheral neuropathy (PDPN).

Materials and Methods: The extracted data about every study included: journal, year of publication, number of authors, country of manuscript origin, goal of article (evaluation or intervention or both), subtypes of evaluation (tool development or measurement of QoL or multiple tools or mixed) and intervention (medical, surgical, or allied health), population characteristics (homogeneous or heterogeneous), type of article (original or review) which was further subclassified under study designs and respective Center for Evidence-Based Medicine (CEBM) levels of evidence.

Results: Descriptive analysis showed more number of QoL articles: from Diabetes Care; with more than three authors; published in the year 2008; originated from USA; on evaluation; on heterogeneous population; more original articles; and more articles with levels 4 or 5 evidence.

Conclusion: The study findings provided a content analysis and synthesized findings from articles published on QoL in population with PDPN or DPNP, and the predominance of evaluation studies was evident, with inter-measure analyses, and more number of articles on medical management among the intervention studies. Levels of evidence for most of the articles were low, and there is need for future high quality studies and reporting standards in articles for effective evidence-informed foot and ankle rehabilitation in people with PDPN.

Keywords: Evidence-based diabetes care; Diabetic peripheral neuropathic pain; Foot and ankle dysfunction; Painful diabetic peripheral neuropathy.

Corresponding author: Senthil P. Kumar, Founder-President, Academy of Orthopaedic Manual Physical Therapists (AOMPT)™, Freelancer Physiotherapist and private practitioner, Mangalore, India

E-mail: senthilparamasivamkumar@gmail.com

(Received on 09.05.2013, Accepted on 11.06.2013)

Introduction

Foot and ankle dysfunction secondary to peripheral nerve damage is the most common microvascular complication in individuals with diabetes mellitus[1] and is associated with altered somatosensory functions such as severe chronic disabling pain, bilateral 'glove and stocking' distribution of pins and needles, sensory and motor deficits in the legs and feet, and impaired gait, balance and psychosocial functions.[2]

The painful state is recognized as Diabetic peripheral neuropathic pain (DPNP)[3] and the clinical condition is termed as Painful diabetic peripheral neuropathy (PDPN)[4] which presents commonly as distal symmetric polyneuropathy affecting both legs and feet.

Impaired functional activities from foot and ankle dysfunctions in PDNP individuals include nocturnal pain associated with sleep disturbances, difficulty in foot positions and movements, difficulty in walking and general mobility.[5]

Due its multifactorial aetiopathologic association and multidimensional clinical presentation, the individuals with PDPN have serious psychosocial consequences of the disorder that influence their limitations in activity and causes restrictions in participation.[6] This invariably affects their overall well-being which is measured as 'Quality of life' (QoL).[7] According to an evidence-informed paradigm of care for patients with diabetes and its complications, a comprehensive multi disciplinary biopsychosocial model of evaluation and intervention emphasizing on QoL was recommended by practice guidelines, consensus documents and position statements.[8] Thus there is a need to evaluate the existing evidence for research articles on QoL in PDPN so that future policies regarding scientific conduct, research reporting, journal publication and database indexation processes could be derived.

This study aimed to perform a systematic review and quantitative content analysis of articles emphasizing QoL in people with DPNP and PDPN.

Materials and Methods:

Study design

Systematic review

Search methods

The search methodology was a replication of a previously used method by Kumar.[9]

Search strategy

The search terms, 'quality of life', 'diabetes / diabetic' and 'neuropathy / neuropathic' were used through advanced search feature of PubMed[10] as follows: "quality of life" [Title] AND (diabetic [Title / Abstract] OR diabetes [Title / Abstract]) AND (neuropathy [Title / Abstract] OR neuropathic [Title / Abstract]). The initial list of retrived citations were scrutinized for their relevance to DPNP or PDPN to obtain final list of articles for inclusion in data extraction and synthesis.

Data extraction

The extracted data about study included: journal, year of publication, number of authors, country of manuscript origin, goal of article (evaluation or intervention or both), subtypes of evaluation (tool development or measurement of QoL or multiple tools or mixed) and intervention (medical, surgical, or allied health), population characteristics (homogeneous or heterogeneous), type of article (original or review) which was further

subclassified under study designs and respective Center for Evidence-Based Medicine CEBM levels of evidence.[11].

Data synthesis

The categories and sub-categories were compared between QoL evaluation and intervention studies to derive the relative prevalence of reporting for various article characteristics in QoL studies.

Data analysis

Overall analysis was done descriptively and reported in frequencies calculated through Microsoft excel worksheet.

Results-main findings

Our initial search yielded 50 articles and after further scrutiny, we obtained a final list of 43 articles for inclusion into data extraction and synthesis. The seven excluded articles were not on diabetic neuropathy or neuropathic pain in diabetes.

A total number of 34 journals published the 43 articles[11-53] on QoL in DPN, and the journals were AMI[22], AMS[37], BJA[14], BRN [42], CE[15], CJP[47], CT[53], DAM[27], DC [11,45,46,52], DIA[17,40], DMRR[36], DRCP [18,32,49], FAI[43], FAS[29], HQLO[21,31], IJLEW[20], IJPM[23], JAANP[26], JACC[35], JACM[12], JDST[25], JFAS[33], JPSM[24],

Figure 1: Comparison for number of QoL in PDPN articles among the journals

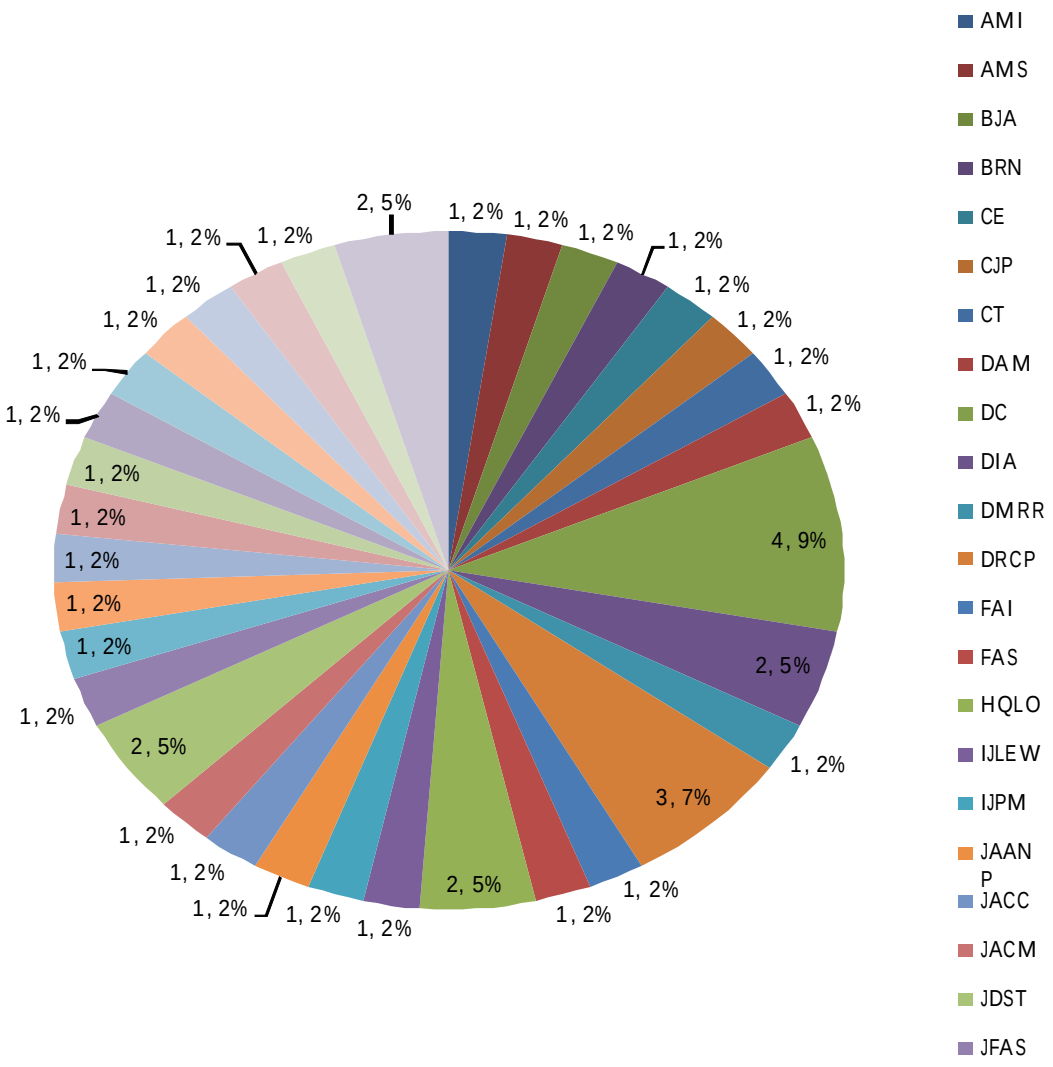
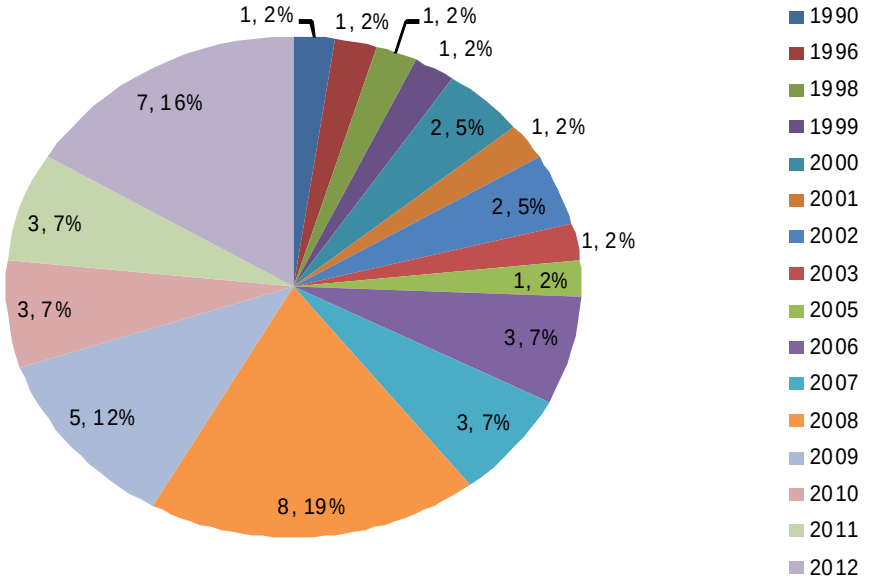


Figure 2: Comparison for number of QoL in PDPN articles among the years of publication



MCP[41], N[39], NHS[13], NNR[44], P[28], PCN[30], PDI[50], PM[38], QJM[51], RLAE [16], and VH[34,48] (Figure 1).

The articles were published over the past 22 years-1990[53], 1996[52], 1998[51], 1999[50], 2000[44,49], 2001[48], 2002[46], 2003[45], 2005[43], 2006[40,41,42], 2007[37,38,39], 2008[25,29,31-37], 2009[22,26-28,30], 2010 [21,23,24], 2011[16,19,20], and 2012[11-18] (Figure 2).

The number of authors per article were zero[52], one[28,36,47], two[12,50,53], three [18,49,21,39,44,38,51,48], four[22,19,25,33,41], five[17,32,43,23,35,13,30], six[31,20,16,34], seven[11,29], eight[42,27,40], nine[45,46], ten[24,26,37], eleven[15], and twelve[14] (Figure 3).

The articles were published from 15 countries including Belgium[27], Brazil[16], Canada[29], China[13], Germany[32], Iran[22], Japan[30], Netherlands[14,36],

Figure 3: Comparison for number of QoL in PDPN articles among the number of authors per article

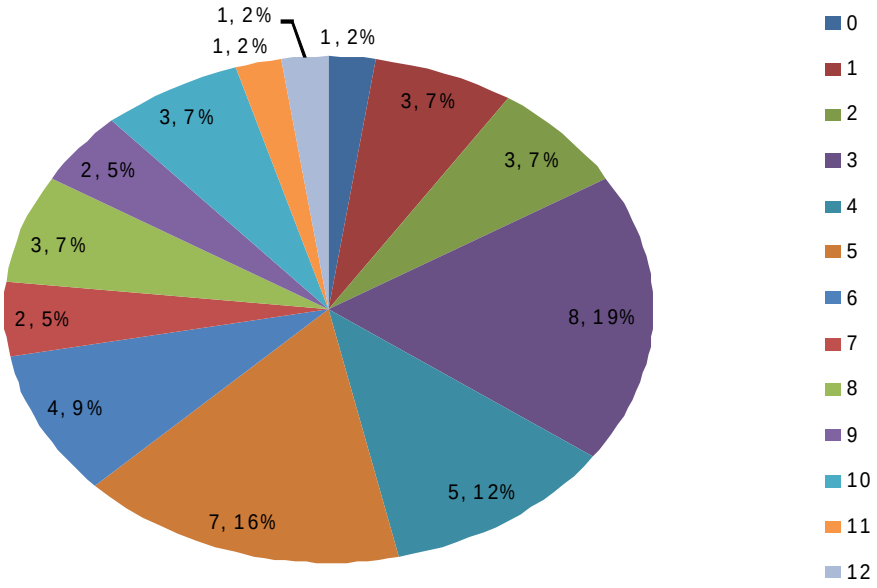
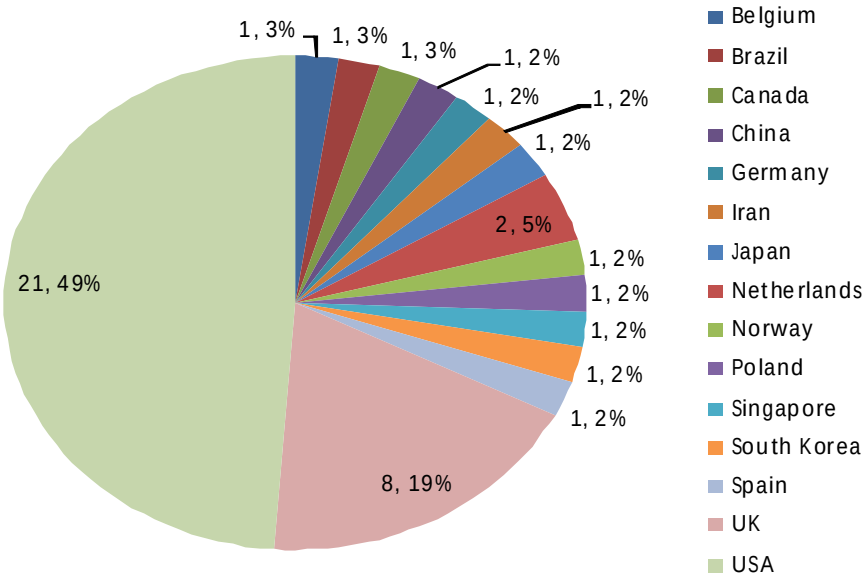


Figure 4: Comparison for number of QoL in PDPN articles among the countries



Norway[21], Poland [37], Singapore[15], South Korea[12], Spain[20], UK[11,17,18, 40,45,48,50,51] and USA [19,23-26,28,31,33-35,38,39,41-47,49,52,53] (Figure 4).

There were articles on evaluation[13,15-18,20,21,23,25-35,37,39-51], intervention[11, 12,14,19,22,24,38,52,53] and both[36,39] (Figure 5). Among the article on evaluation of QoL, there were articles on tool development/ adaptation/validation[16,23,25,31,34,44,45], measurement of QoL[13,29,32,46,51], multiple variables comparison/correlation/association [15,20,21,26,27,30,33,35,40,42,43,47-50] and mixed[17,18,28,41] (Figure 6). Among the articles on intervention, there were articles on medical/pharmacological management[11,19, 38,52], surgical (invasive/non-invasive)[14,53] and allied health interventions[12,22,24] (Figure 7).

There were articles that focused mainly on diabetic neuropathy or neuropathic pain in diabetic population[11,12,14,16,19,24,27,29,32,

Figure 5: Comparison for number of QoL in PDPN articles on evaluation, intervention or both

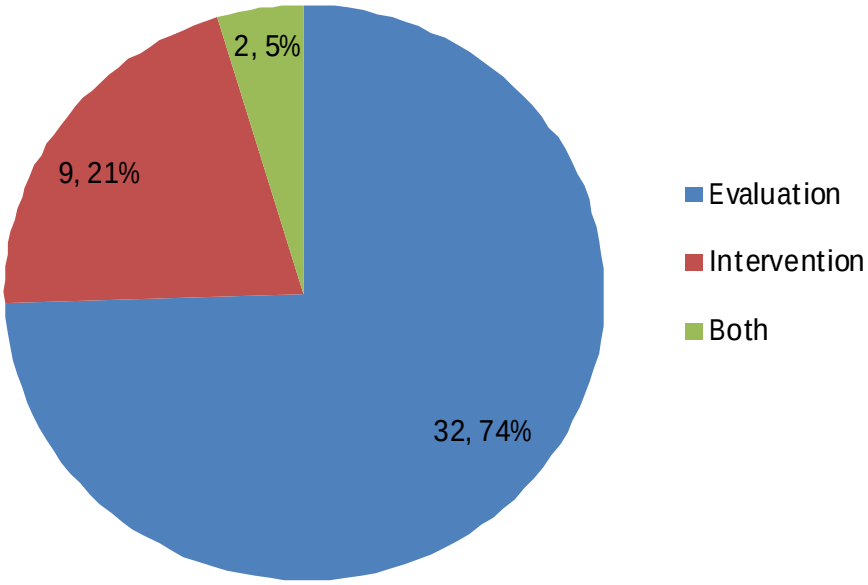
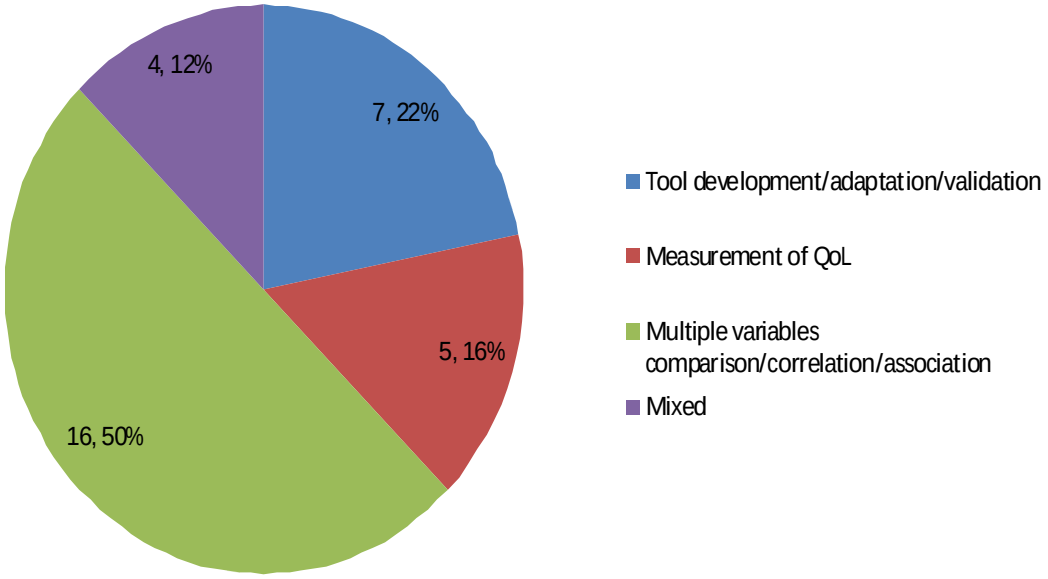


Figure 6: Comparison for number of articles on evaluation of QoL in PDPN for its subcategories



44,45,49,51] which were regarded as homogenous and articles that focused on neuropathic pain with diabetic subgroup or diabetes individuals with neuropathic symptom subgroup or diabetic neuropathy with other disorders[13,15,17,18,20-23,25,26,28,30,31,33-43,46-48,50,52,53] which were considered as heterogeneous (Figure 8).

There were original articles[11-16,19-27,29-35,37,40,42-49,51-53] that included randomized controlled trials[11,19,24,52], non-randomized controlled trials[12,22], case-control studies[15,20,21], quasi-experimental studies[14] and cross-sectional studies[13,16,23, 25-27,29-35, 37,40,42-49,51,53]; and review articles[17,18,28,36,38,39,41,50] which were narrative[28,36,38,39,41,50] and systematic [17,18] (Figure 9,10).

The articles were of level-1 evidence[11,17, 18,19,24,52], level-2 evidence [12,22], level-3 evidence[15,20,21], level-4 evidence[13,14,

Figure 7: Comparison for number of articles on intervention of QoL in PDPN for its subcategories

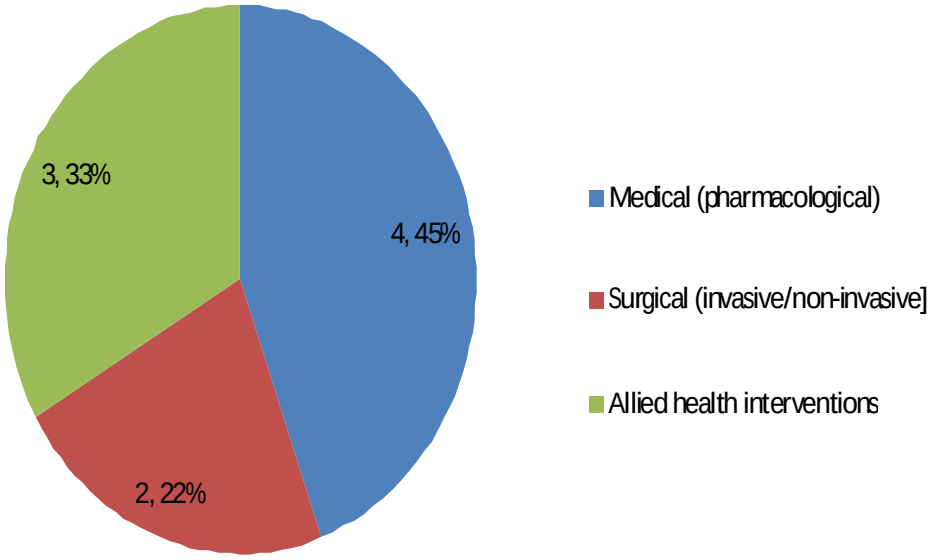


Figure 8: Comparison for number of articles on QoL in PDPN for homogeneous and heterogeneous population characteristics

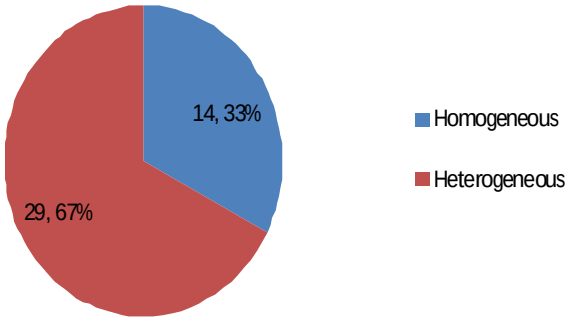
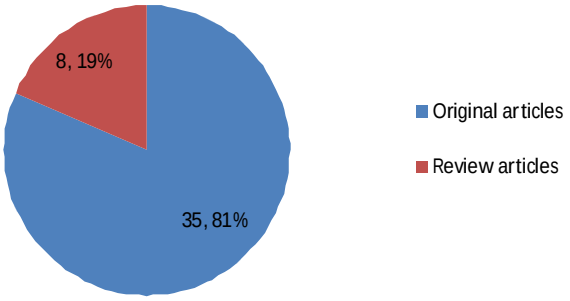


Figure 9: Comparison for number of articles on QoL in PDPN for article types



16,23,25-27,29-35,37,40,42-49,51,53] and level-5 evidence[26,36,38, 39,41,50] (Figure 11).

Discussion

This study aimed at evaluating articles emphasizing QoL among studies on PDPN patients and found an alarmingly lesser number of studies, with a positive shift towards increased number of articles as original articles,

The reasons for this lesser number of studies could be partly due to the non-validated search strategy and use of only one database such as PubMed, though such method was previously reported in literature.[54] PubMed was used since it was freely available online, and is the largest and most accepted source of scientific information around the world.[55] An effort to initialize a scientific movement in the direction of emphasis on QoL was attempted through assigning the QoL term in title, whilst other search options would have yielded different results.

More articles were indexed in year 2008, the cause for which could be explored by longitudinal trend analysis of evidence for QoL in PubMed. Coincidentally, the WHO policy on QoL and Biopsychosocial model was established much earlier under the 'health for all' policy.[56] More articles on QoL had more than three authors and multiple authorship was a positive trend for research since it was shown to be involved with interprofessional collaborative works in a 'publish or perish' era.[57]

Amongst the journals which published the few studies found, Diabetes Care had the largest number of four articles, which indicates

Figure 10: Comparison for number of articles on QoL in PDPN for study designs

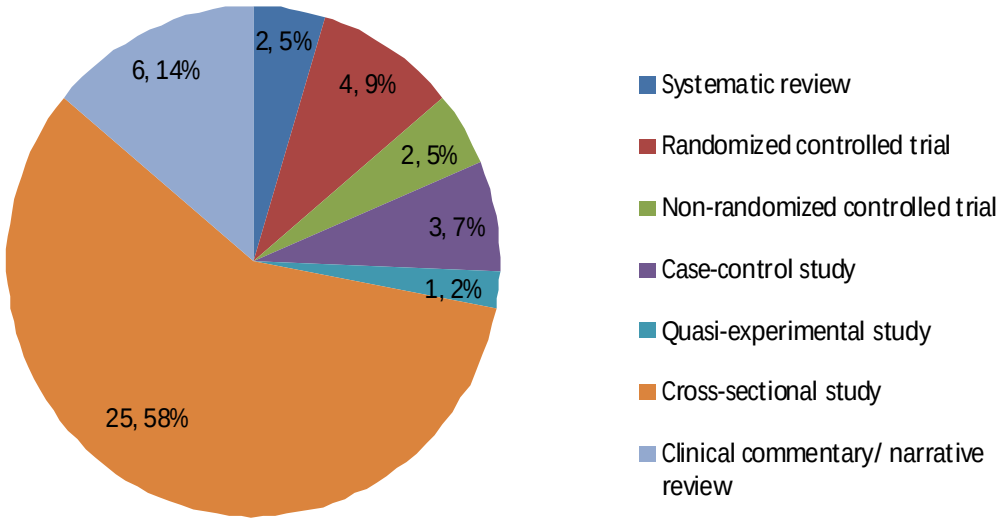
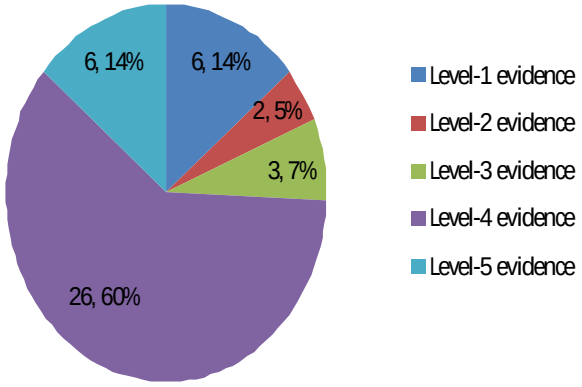


Figure 11: Comparison for number of articles on QoL in PDPN for levels of evidence



a journal-specific analysis of reporting trend for QoL. Nearly half the studies were from USA, and more than half the number of articles was on evaluation, with studies on comparison / association / correlation between QoL measure and other tools being more common. Medical management was more represented among the interventions, as supporting evidence in that area is relatively large, both for diabetes[58] and for neuropathic pain.[59]

Heterogeneous studies were more in number which explained the multidimensional impact of QoL on other aspects of clinical presentation in PDPN. Not only that neuropathic pain is one of the most common complications of diabetes, but also diabetes is the most leading cause for neuropathic pain. This fact is often well understood as many other causes for neuropathic pain other than diabetes such as post-herpetic neuralgia, chemotherapy-induced or HIV-related, as many other symptoms in diabetes patients such as retinopathy, nephropathy, angiopathy, and other foot-related complications.

This study found no articles that focused on caregivers or preventive research, which calls for an action plan on clinical research priorities in individuals with PDPN.[60,61] The QoL instruments used in the studies were relatively lesser, when compared to many generic and disease-specific measures[62] available both for diabetes[63] and for neuromuscular disorders.[65] Although a single measurement tool was not widely used or recommended, the need for a comprehensive tool still remain unmet.

More cross-sectional studies of level-4 evidence represented the emergence of reliability[65] and validity studies[66] for questionnaires and self-reported outcome measures for evaluation of QoL in PDPN. Overall, there was a greater number of articles on levels 4,5 evidence which opens the scope for future systematic reviews and meta-analyses.[67] It should also be inferred in accordance with future development of editorial policies that randomized controlled trials need to report[68] the term QoL in title in their evaluation of effects, efficacy and effectiveness of interventions.[69]

Conclusion

The study findings provided a content analysis and synthesized findings from articles published on QoL in population with PDPN or DPNP, and the predominance of evaluation studies was evident, with inter-measure analyses, and more number of articles on medical management among the intervention studies. Levels of evidence for most of the articles were low, and there is need for future high quality studies and reporting standards in articles for effective evidence-informed foot and ankle rehabilitation in people with PDPN.

References

1. Tapp RJ, Shaw JE, de Courten MP, Dunstan DW, Welborn TA, Zimmet PZ, *et al.* Aus Diab Study Group. Foot complications in Type 2 diabetes: an Australian population-based study. *Diabet Med*. 2003; 20: 105-13.
2. Podwall D, Gooch C. Diabetic neuropathy: clinical features, etiology, and therapy. *Curr Neurol Neurosci Rep*. 2004; 4: 55-61.
3. Morales-Vidal S, Morgan C, McCoyd M, Hornik A. Diabetic peripheral neuropathy and the management of diabetic peripheral neuropathic pain. *Postgrad Med*. 2012; 124: 145-53.
4. Tesfaye S, Vileikyte L, Rayman G, Sindrup S,

Perkins B, Baconja M, *et al.* On behalf of the Toronto Expert Panel on Diabetic Neuropathy. Painful Diabetic Peripheral Neuropathy: Consensus Recommendations on Diagnosis, Assessment and Management. *Diabetes Metab Res Rev*. 2011; doi: 10.1002/dmrr.1225.

5. Gale L, Vedhara K, Searle A, Kemple T, Campbell R. Patients' perspectives on foot complications in type 2 diabetes: a qualitative study. *Br J Gen Pract*. 2008; 58: 555-63.
6. Price P, Harding K. The impact of foot complications on health-related quality of life in patients with diabetes. *J Cutan Med Surg*. 2000; 4: 45-50.
7. Porojan M, Poantã L, Dumitraºcu DL. Assessing health related quality of life in diabetic patients. *Rom J Intern Med*. 2012; 50: 27-31.
8. Wraight PR, Lawrence SM, Campbell DA, Colman PG. Creation of a multidisciplinary, evidence based, clinical guideline for the assessment, investigation and management of acute diabetes related foot complications. *Diabet Med*. 2005; 22: 127-36.
9. Kumar SP. Reporting of "quality of life": a systematic review and quantitative analysis of research publications in palliative care journals. *Indian J Palliat Care*. 2012; 18: 59-67.
10. Sood A, Erwin PJ, Ebbert JO. Using advanced search tools on PubMed for citation retrieval. *Mayo Clin Proc*. 2004; 79: 1295-9.
11. Boyle J, Eriksson ME, Gribble L, Gouni R, Johnsen S, Coppini DV, *et al*. Randomized, Placebo-Controlled Comparison of Amitriptyline, Duloxetine, and Pregabalin in Patients With Chronic Diabetic Peripheral Neuropathic Pain: Impact on pain, polysomnographic sleep, daytime functioning, and quality of life. *Diabetes Care*. 2012; 35(12): 2451-8.
12. Ahn S, Song R. Effects of tai chi exercise on glucose control, neuropathy scores, balance, and quality of life in patients with type 2 diabetes and neuropathy. *J Altern Complement Med*. 2012; 18(12): 1172-8.
13. Cong JY, Zhao Y, Xu QY, Zhong CD, Xing QL. Health-related quality of life among Tianjin Chinese patients with type 2 diabetes: A cross-sectional survey. *Nurs Health Sci*. 2012; 14(4): 528-34.
14. Pluijms WA, Slangen R, Bakkers M, Faber CG, Merkies IS, Kessels AG, *et al*. Pain relief and quality-of-life improvement after spinal cord stimulation in painful diabetic polyneuropathy: a pilot study. *Br J Anaesth*. 2012; 109(4): 623-9.
15. Venkataraman K, Wee HL, Leow MK, Tai ES, Lee J, Lim SC, *et al*. Associations between complications and Health Related Quality of Life in individuals with diabetes. *Clin Endocrinol (Oxf)*. 2012. doi: 10.1111/j.1365-2265.2012.04480.x. [Epub ahead of print]
16. Xavier AT, Foss MC, Marques Junior W, dos Santos CB, Onofre PT, Pace AE. Cultural adaptation and validation of the Neuropathy - and Foot Ulcer - Specific Quality of Life instrument (NeuroQol) for Brazilian Portuguese - Phase 1. *Rev Lat Am Enfermagem*. 2011; 19(6): 1352-61.
17. Hogg FR, Peach G, Price P, Thompson MM, Hinchliffe RJ. Measures of health-related quality of life in diabetes-related foot disease: a systematic review. *Diabetologia*. 2012; 55(3): 552-65.
18. Smith SC, Lamping DL, Maclaine GD. Measuring health-related quality of life in diabetic peripheral neuropathy: a systematic review. *Diabetes Res Clin Pract*. 2012; 96(3): 261-70.
19. Boyd A, Casselini C, Vinik E, Vinik A. Quality of life and objective measures of diabetic neuropathy in a prospective placebo-controlled trial of ruboxistaurin and topiramate. *J Diabetes Sci Technol*. 2011; 5(3): 714-22.
20. García-Morales E, Lázaro-Martínez JL, Martínez-Hernández D, Aragón-Sánchez J, Beneit-Montesinos JV, González-Jurado MA. Impact of diabetic foot related complications on the Health Related Quality of Life (HRQol) of patients—a regional study in Spain. *HIfgnt J Low Extrem Wounds*. 2011; 10(1): 6-11.
21. Solli O, Stavem K, Kristiansen IS. Health-related quality of life in diabetes: The associations of complications with EQ-5D scores. *Health Qual Life Outcomes*. 2010; 8: 18.
22. Baghianimoghadam MH, Afkhami, Ardekani M, Baghianimoghadam B. Effect of education on improvement of quality of life by SF-20 in type 2 diabetic patients. *Acta Med Indones*. 2009; 41(4): 175-80.
23. Zapata-Vega MI, Rivera J, Tarlin N, Bijan I, Maurer M. Using a brief 10-item generic measure of quality of life in English and Spanish speaking diabetic patients. *Int J Psychiatry Med*. 2010; 40(4): 399-411.

24. Swislocki A, Orth M, Bales M, Weisshaupt J, West C, Edrington J, *et al*.A randomized clinical trial of the effectiveness of photon stimulation on pain, sensation, and quality of life in patients with diabetic peripheral neuropathy. *J Pain Symptom Manage*. 2010; 39(1): 88-99.
25. Vinik EJ, Paulson JF, Ford-Molvik SL, Vinik AI. German-translated Norfolk quality of life (QOL-DN) identifies the same factors as the English version of the tool and discriminates different levels of neuropathy severity. *J Diabetes Sci Technol*. 2008; 2(6): 1075-86.
26. Lee HJ, Chapa D, Kao CW, Jones D, Kapustin J, Smith J, *et al*. Depression, quality of life, and glycemic control in individuals with type 2 diabetes. *J Am Acad Nurse Pract*. 2009; 21(4): 214-24.
27. Van Acker K, Bouhassira D, De Bacquer D, Weiss S, Matthys K, Raemen H, *et al*. Prevalence and impact on quality of life of peripheral neuropathy with or without neuropathic pain in type 1 and type 2 diabetic patients attending hospital outpatients clinics. *Diabetes Metab*. 2009; 35(3): 206-13.
28. O'Connor AB. Neuropathic pain: quality-of-life impact, costs and cost effectiveness of therapy. *Pharmacoeconomics*. 2009; 27(2): 95-112.
29. Sochocki MP, Verity S, Atherton PJ, Huntington JL, Sloan JA, Embil JM, *et al*. Health related quality of life in patients with Charcot arthropathy of the foot and ankle. *Foot Ankle Surg*. 2008; 14(1): 11-5.
30. Yoshida S, Hirai M, Suzuki S, Awata S, Oka Y. Neuropathy is associated with depression independently of health-related quality of life in Japanese patients with diabetes. *Psychiatry Clin Neurosci*. 2009; 63(1): 65-72.
31. Huang IC, Liu JH, Wu AW, Wu MY, Leite W, Hwang CC. Evaluating the reliability, validity and minimally important difference of the Taiwanese version of the diabetes quality of life (DQOL) measurement. *Health Qual Life Outcomes*. 2008; 6: 87.
32. Happich M, John J, Stamenitis S, Clouth J, Polnau D. The quality of life and economic burden of neuropathy in diabetic patients in Germany in 2002—results from the Diabetic Microvascular Complications (DIMICO) study. *Diabetes Res Clin Pract*. 2008; 81(2): 223-30.
33. Armstrong DG, Lavery LA, Wrobel JS, Vileikyte L. Quality of life in healing diabetic wounds: does the end justify the means? *J Foot Ankle Surg*. 2008; 47(4): 278-82.
34. Huang IC, Hwang CC, Wu MY, Lin W, Leite W, Wu AW. Diabetes-specific or generic measures for health-related quality of life?Evidence from psychometric validation of the D-39 and SF-36.*Value Health*. 2008; 11(3): 450-61.
35. Allison MA, Hiatt WR, Hirsch AT, Coll JR, Criqui MH. A high ankle-brachial index is associated with increased cardiovascular disease morbidity and lower quality of life. *J Am Coll Cardiol*. 2008; 51(13): 1292-8.
36. van Schie CH. Neuropathy: mobility and quality of life. *Diabetes Metab Res Rev*. 2008; 24(Suppl 1): S45-51.
37. Lewko J, Polityñska B, Kochanowicz J, Zarzycki W, Okruszko A, Sierakowska M, *et al*. Quality of life and its relationship to the degree of illness acceptance in patients with diabetes and peripheral diabetic neuropathy. *Adv Med Sci*. 2007; 52(Suppl 1): 144-6.
38. Wu SC, Wrobel JS, Armstrong DG.Assessing the impact of pharmacologic intervention on the quality of life in diabetic peripheral neuropathic pain and fibromyalgia. *Pain Med*. 2007; 8(Suppl 2): S33-42. Review.
39. Jensen MP, Chodroff MJ, Dworkin RH. The impact of neuropathic pain on health-related quality of life: review and implications. *Neurology*. 2007; 68(15): 1178-82.
40. Currie CJ, Poole CD, Woehl A, Morgan CL, Cawley S, Rousculp MD, *et al*. The health-related utility and health-related quality of life of hospital-treated subjects with type 1 or type 2 diabetes with particular reference to differing severity of peripheral neuropathy. *Diabetologia*. 2006; 49(10): 2272-80.
41. Argoff CE, Cole BE, Fishbain DA, Irving GA. Diabetic peripheral neuropathic pain: clinical and quality-of-life issues. *Mayo Clin Proc*. 2006; 81(4 Suppl): S3-11.
42. Chyun DA, Melkus GD, Katten DM, Price WJ, Davey JA, Grey N, *et al*.The association of psychological factors, physical activity, neuropathy, and quality of life in type 2 diabetes. *Biol Res Nurs*. 2006; 7(4): 279-88.
43. Willrich A, Pinzur M, McNeil M, Juknelis D, Lavery L. Health related quality of life, cognitive function, and depression in diabetic patients with foot ulcer or amputation. A preliminary

study. *Foot Ankle Int*. 2005; 26(2): 128-34.

44. Vickrey BG, Hays RD, Beckstrand M. Development of a health-related quality of life measure for peripheral neuropathy. *Neurorehabil Neural Repair*. 2000; 14(2): 93-104.
45. Vileikyte L, Peyrot M, Bundy C, Rubin RR, Leventhal H, Mora P, *et al*. The development and validation of a neuropathy- and foot ulcer-specific quality of life instrument. *Diabetes Care*. 2003; 26(9): 2549-55.
46. Coffey JT, Brandle M, Zhou H, Marriott D, Burke R, Tabaei BP, *et al*. Valuing health-related quality of life in diabetes. *Diabetes Care*. 2002; 25(12): 2238-43.
47. Schmader KE. Epidemiology and impact on quality of life of postherpetic neuralgia and painful diabetic neuropathy. *Clin J Pain*. 2002; 18(6): 350-4.
48. Lloyd A, Sawyer W, Hopkinson P. Impact of long-term complications on quality of life in patients with type 2 diabetes not using insulin. *Value Health*. 2001; 4(5): 392-400.
49. Galer BS, Gianas A, Jensen MP. Painful diabetic polyneuropathy: epidemiology, pain description, and quality of life. *Diabetes Res Clin Pract*. 2000; 47(2): 123-8.
50. Apostolou T, Gokal R. Neuropathy and quality of life in diabetic continuous ambulatory peritoneal dialysis patients. *Perit Dial Int*. 1999; 19(Suppl 2): S242-7.
51. Benbow SJ, Wallymahmed ME, MacFarlane IA. Diabetic peripheral neuropathy and quality of life. *QJM*. 1998; 91(11): 733-7.
52. [No authors listed]Influence of intensive diabetes treatment on quality-of-life outcomes in the diabetes control and complications trial. *Diabetes Care*. 1996; 19(3): 195-203.
53. Corry RJ, Zehr P. Quality of life in diabetic recipients of kidney transplants is better with the addition of the pancreas. *Clin Transplant*. 1990; 4(4): 238-41.
54. Azim Majumder MA, Shaban SF, Rahman S, Rahman N, Ahmed M, Bin Abdulrahman KA, *et al*. PubMed-based quantitative analysis of biomedical publications in the SAARC countries: 1985-2009. *J Coll Physicians Surg Pak*. 2012; 22: 560-4.
55. Balakumar P, Marcus SJ, Jagadeesh G. Navigating your way through online resources for biomedical research. *RGUHS J Pharm Sci*. 2012; 2: 5-27.
56. Lindström B. Quality of life: a model for evaluating health for all Conceptual considerations and policy implications. *Soz Praventivmed*. 1992; 37: 301-6.
57. de Villiers FP. Publish or perish—the growing trend towards multiple authorship. *S Afr Med J*. 1984; 66: 882-3.
58. Cuny T, Guerci B, Cariou B. New avenues for the pharmacological management of type 2 diabetes: An update. *Ann Endocrinol (Paris)*. 2012; 73: 459-68.
59. Dworkin RH, O'Connor AB, Audette J, Baron R, Gourlay GK, Haanpää ML, *et al*. Recommendations for the pharmacological management of neuropathic pain: an overview and literature update. *Mayo Clin Proc*. 2010; 85(3 Suppl): S3-S14.
60. Kamprath S, Timmer A. Prioritisation of clinical research by the example of type 2 diabetes: a caregiver-survey on perceived relevance and need for evidence. *PLoS One*. 2012; 7: e32414.
61. Laws RA, St George AB, Rychetnik L, Bauman AE. Diabetes prevention research: a systematic review of external validity in lifestyle interventions. *Am J Prev Med*. 2012; 43: 205-14.
62. Tirico PP, Stefano SC, Blay SL. Validity studies of quality of life instruments for eating disorders: systematic review of the literature. *J Nerv Ment Dis*. 2010; 198: 854-9.
63. de Wit M, Delemarre-van de Waal HA, Pouwer F, Gemke RJ, Snoek FJ. Monitoring health related quality of life in adolescents with diabetes: a review of measures. *Arch Dis Child*. 2007; 92: 434-9.
64. Burns TM, Graham CD, Rose MR, Simmons Z. Quality of life and measures of quality of life in patients with neuromuscular disorders. *Muscle Nerve*. 2012; 46: 9-25.
65. Dunn G. Design and analysis of reliability studies. *Stat Methods Med Res*. 1992; 1: 123-57.
66. Benchimol EI, Manuel DG, To T, Griffiths AM, Rabeneck L, Guttmann A. Development and use of reporting guidelines for assessing the quality of validation studies of health administrative data. *J Clin Epidemiol*. 2011; 64: 821-9.
67. Rudnicka AR, Owen CG. An introduction to systematic reviews and meta-analyses in health

care. *Ophthalmic Physiol Opt*. 2012; 32: 174-83.

68. Tharyan P, Premkumar TS, Mathew V, Barnabas JP, Manuelraj. Editorial policy and the reporting of randomized controlled trials: a survey of instructions for authors and assessment of trial reports in Indian medical journals (2004-05). *Natl Med J India*. 2008; 21: 62-8.
69. Kumar SP. Effects, efficacy, efficiency, effectiveness…of physical therapy- how far are we? *J Phys Ther*. 2011; 3: 33-7.