IOSR Journal of Nursing and Health Science (IOSR-JNHS)
e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 15, Issue 3 Ser. III (May. – June. 2026), PP 01-07
www.iosrjournals.org

A Study to Assess the Effectiveness of Demonstration on Practice of Self Administration of Insulin Among Diabetic Patients Living in Selected Community Areas of Tapi District, Gujarat.

Suraj S. Vasave [1], Twinkal Patel [2], Poonam Patel[3]
[1](M.Sc. Nursing students, Department of Medical Surgical Nursing, S.S. Agrawal College of Nursing Training College & Research Centre, Navsari, Veer Narmad South Gujarat University, Surat, Gujarat, India)
[2](Assistant Professor, Department of Medical Surgical Nursing, S.S. Agrawal College of Nursing Training College & Research Centre, Navsari Gujarat, India)
[3](Associate Professor, Department of Medical Surgical Nursing, S.S. Agrawal College of Nursing Training College & Research Centre, Navsari Gujarat, India)

Abstract:
Background*: Diabetes Mellitus, a global public health problem, is now growing as an epidemic in both developed and developing countries. Health care professionals need to recognise the magnitude and seriousness of this disease and act as a catalyst in providing care to those individuals with diabetes. Diet, exercise, weight loss, and a healthy lifestyle remain essential in the initial and ongoing management of diabetes. Even when insulin is prescribed appropriate patient education can do much to alleviate fears and misconceptions related to insulin administration. Proper practice knowledge regarding self-insulin administration technique is necessary for controlling the elevated levels of blood glucose. Insulin administration requires more importance because its improper use may not produce the expected result in the individual. So, the researcher felt the need to educate people regarding proper method of self-insulin administration*
Methods*: In the study quantitative research approach was adopted. Pre- experimental one group pre-test post-test research design was adopted. Total 40 samples size were selected by purposive sampling techniques method in Selected Community Areas of Tapi District, Gujarat. Ethical consideration was taken from the college to conduct the study. The data collection was done over a period of 4 weeks. The tool consisted of selected socio-demographic variable, Clinical variable and Practice checklist of Self-Administration of Insulin injection. Data analysis was done by descriptive and inferential statistics.*
Results*: In this research study, findings reveal that the post-test mean practice scores was found to be higher [mean=22.71, SD of 3.02] when compared with pre-test mean practice score value which was 9.97 with SD of 3.03. The statistical paired 't' implies that the difference in the pretest and post-test value was found statistically significant at 5% level (P<0.05) with a paired 't' value of 22.71. There exists a statistical significance in the difference of practice score indicating the positive impact of demonstration.*
Conclusion: *The Demonstration on Practice of Self Administration of Insulin was found to be effective in improve the practice among diabetic patients in the research group*
Key Word*: Effectiveness, Demonstration, Practice of Self Administration of Insulin, Diabetic Patients, Selected Community Areas.*

Date of Submission: 06-06-2026 Date of Acceptance: 17-06-2026

I. Introduction

Diabetes Mellitus is a metabolic disorder, which occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the Insulin, it produces. This leads to an increased concentration of glucose in the blood (hyperglycemia). Type 1 Diabetes (previously known as Insulin-dependent or childhood-onset diabetes) is characterized by a lack of Insulin production. Type-2 Diabetes (formerly called noninsulin-dependent or adult-onset diabetes) is caused by the body 's ineffective utilization of Insulin. It often results from excess body weight and physical inactivity. the control and treatment of Diabetes mellitus is of prime importance. The controlling measures include diet restriction, exercises, oral Administration of hypoglycemic agents and ultimately Insulin therapy. Insulin Administration requires more importance because its improper use may not produce the expected result in the individual. So, the current study aims to educate people regarding proper methods of Self-Insulin Administration among selected community areas in Gujarat, India.

II. Material and Methods

This pre-experimental study was carried out at several community areas of Tapi districts, Gujarat. from 1st November 2024 to 30th November 2024. A total 40 adult Diabetic Patients who are taking insulin injection who all are match the criteria for subjects (both male and female) of aged ≥ 18, years were included in this study.

Study Design: Pre – experimental research design (one group pre- test post -test)

Study Location: This was a from village come under the PHCs – Vanka, Velda, Raigadh, Chitpur, Tapi district, Gujarat.

Study Duration: 1st November 2024 to 30th November 2024.

Sample size: 40 patients.

Sample selection method: The sampling technique adopted for the study was Non – Probability Purposive sampling technique. Non probability sampling is a technique wherein the samples are gathered in a process that does not give all the individuals in the population equal chances of being selected in the sample. In other words, in this type of sampling every subject does not by chance through non random sampling methods. Purposive sampling techniques is the type of sampling technique this sample was chosen by choice not by chance, through a judgment made by researcher based on knowledge about the population.

Inclusion criteria:

Diabetes mellitus patients who are:

1. Receiving treatment with prescribed insulin therapy.
2. Present during data collection.
3. Willing to participate in the study.
4. Able to understand Gujarati, and English.

Exclusion criteria:

Diabetes mellitus patients who are:

1. Absent on the time of data collection
2. Who are not able to read have a cognitive impairment or any communication issues that interface with understanding of the language use.
3. Who are not willing to participants.

Procedure methodology

After a formal permission was obtained from ethics committee of institution and chief district health officer of Tapi district. The study participants those who are full fill their inclusion criteria were selected by non- probability purposive sampling technique. Total no of samples is 40. A brief explanation about the study purpose and importance has been explained to participants. Assurance was given to the participants that; the collected data was utilized only for the purpose of the study. I visited community area and introduced myself to patients, explaining the purpose and importance of the study in simple and understandable term. The necessity of obtaining both assent and consent from patients was clearly emphasized. Consent and assent forms were distributed and explained, ensuring that confidentially of the reposes would be strictly maintained and the right to withdraw at any stage.

The final study was conducted on 1st November to 30th November 2024 at different villages come under PHC, Vanka, Velda, Raigadh & Chitpur. First, the investigator should introduce them self with kindly manner and maintain the good rapport with participants and collect using that data regarding the demographic variable, clinical variable was collected and practice was assessed by using the observational Practice checklist of Self-Administration of Insulin.

Procedure for data collection

Collect the data in 3 steps;

Step 1: Assess the Practice of Self-Administration of Insulin before Demonstration

Step 2: Demonstration on Self-Administration on Insulin by procedure of Self-Administration of Insulin.

Step 3: After the intervention, Practice was assessed by observational Practice checklist of Self-Administration of Insulin

Statistical analysis

The analysis was done based on the objectives and hypothesis to be tested. Items related to the background variable would be analysed in terms of frequency and percentage.

The collected data will be analysed using descriptive and inferential statistics using following steps, Organizing the data in master sheet, Frequency and percentage distribution to analyse demographic variable and clinical variable, Mean and standard deviation of practice scores would be used to determine the Effectiveness of the Demonstration, The statistical significance of the effectiveness of the Practice Demonstration would be analysed by using Paired 't' test, Chi square will be used to determine the association between pre-test and post test score, Karl Pearson correlation and coefficient formula was used for pilot study.

III. Result

Table -1 Socio-Demographic profile of participants (n=40)

Sr. no.	Demographic variables	Frequency (f)	Percentage (%)	χ^2 value	P value
1	**Age in years**			9.29 (df =6)	12.59 (NS)
	20-35	01	2.5		
	36-45	12	30		
	46-55	11	27.5		
	56 and above	16	40		
2	**Gender**			12.09 (df =2)	5.99 (S)
	Male	31	77.5		
	Female	09	22.5		
	other	00	00		
	Male	31	77.5		
3	**Religion**			13.96 (df =6)	12.59 (S)
	Hindu	34	85		
	Muslim	02	5		
	Christian	01	2.5		
	Others	03	7.5		
4	**Marital status**			6.59 (df =4)	9.49 (NS)
	Married	33	82.5		
	Unmarried	00	00		
	Widow / Widower	06	15		
	Divorce / Separated	01	2.5		
5	**Education**			23.16 (df =10)	18.31 (S)
	Illiterate	03	7.5		
	Primary Education	12	30		
	Secondary Education	09	22.5		
	Diploma	02	5		
	Graduation	11	27.5		
	Post Graduation	03	7.5		
6	**Occupation**			21.67 (df =10)	18.31 (S)
	Unemployed	03	7.5		
	Farmer	14	35		
	Laboure	03	7.5		
	Government service	03	7.5		
	House wife	09	22.5		
	Other	08	20		
7	**Family Income (Rs/Month)**			8.64 (df =6)	12.59 (NS)
	8000-10000	05	12.5		
	10001-15000	04	10		
	15001-20000	16	40		
	20001-above	15	37.5		
8	**Type of family**			1.67 (df =4)	9.49 (NS)
	Joint family	27	67.5		
	Nuclear family	07	17.5		
	Extended family	06	15		
9	**Sources of information**			4.67 (df =4)	9.49 (NS)
	Health personnels	26	65		
	Multimedia	03	7.5		
	Others	11	27.5		

The table – 1: presents an overview of the Socio-Demographic features of participants involved in the study.
The table depicts data related to **age:** The majority 16 (40%) of the respondents belong to the age group of 56 and above years, 12 (30%) belong to the age group of 36-45 years, 11(27.5%) of respondents belonged to 46-55 years and remaining 1(2.5%) of respondents belonged to 20-35 years of age. The data related to **gender:** The majority 31 (77.5%) of the respondents were males and remaining 09(22.5%) of respondents were females. The data related to **religion**: The majority 34 (85%) of respondents were belonged to Hindu religion, 03(7.5%) of

respondents were belonged to other religion, 02(5%) of respondents were belonged to Muslim religion and remaining 1(2.5%) of respondent was belonged to Christian religion. The data related to **marital status:** The majority 33(82.5%) of respondents were married, 0 (0%) of respondents was unmarried, 6(15%) of respondents were widow or widower and remaining 1(2.5%) of respondent was divorced or separated. The data related to **education:** The majority 12(30%) of respondents were had primary education, 11(27.5%) of respondents were graduated, 9(22.5%) were had secondary education, each 3(7.5%) were illiterates and had post-graduation education and remaining 2(5%) were had diploma education. The data related to **occupation:** The majority 14(35%) of respondents were farmers, 9(22.5%%) of respondents were House wife, 8(20%) of respondents were doing other work and each 3(7.5%) of respondents were unemployed, Laboure's and doing government services. The data related to **family income**: The majority 16(40%) of respondents were had 15001-20000 income, 15(37.5%) were had 20001 and more income 5(12.5%) were had 8000-10000 income and remaining 4(10%) were had 10001-15000 income. The data related to **type of family:** The majority 27(67.5%%) of respondents were belonged to joint family, 7(17.5%) of respondents were belonged to a nuclear family and remaining 6(15%) of respondents were belonged to extended family. The data related to **source of information:** The majority 26(65%) of respondent's source was health personnels, 11(27.5%) of respondent's source was others and remaining 3(7.5%) of respondent's source of information was multimedia.

Table no 2 : Frequency & Percentage Distribution of Respondents according to clinical variables (n=40)

Sr. no.	Clinical variables	Frequency (f)	Percentage (%)	χ^2 value	P value
1	**Duration of illness**			13.04 (df =6)	12.59 (S)
	Up to 5 years	19	47.5		
	6-10 years	16	40		
	11-15 years	4	10		
	> 15 years	1	2.5		
2	**Family History of diabetes**			6.35 (df =2)	5.99 (S)
	Positive	6	15		
	Negative	34	85		
3	**Device used for insulin administration**			0.21 (df =2)	5.99 (NS)
	Syringe	38	95		
	Pen	2	5		
4	**Insulin administration done by**			30.67 (df =6)	12.59 (S)
	Self	12	30		
	Family members	20	50		
	Hospital staff	3	7.5		
	Others	5	12.5		
5	**Frequency of insulin**			1.64 (df =2)	5.99 (NS)
	Once a day	00	00		
	2 times a day	33	82.5		
	3 times a day	07	17.5		
	4 times a day	00	00		
6	**Types of insulin**			0.85 (df =4)	9.59 (NS)
	Rapid acting	04	10		
	Short acting	00	00		
	Intermediate	02	05		
	Mixed insulin	34	85		

The table 2 presents an overview of the Clinical variables of participants involved in the study.

The table depicts data related to **Duration of illness:** The majority 19(47.5%) of respondent's duration of illness was up to 5 years, 16(40%) of respondent's duration of illness was 6-10 years, 4(10%) of respondent's duration was 11-15 years and remaining 1(2.5%) respondents' duration was >15 years. The data related to **family history of Diabetes**: The majority 34(85%) of respondents were had positive history and remaining 6(15%) of respondents were had negative history of Diabetes. The data related to **Device used for Insulin Administration**, the majority 38(95%) of respondents using syringe and remaining 2(5%) of respondents were using pen for Administration of Insulin. The data related to **Administration of Insulin**: The majority 20(50%) of respondent's family members were doing Administration, 12(30%) respondents were self-administrating, 5(12.5%) respondents taking Insulin others and remining 3(7.5%) of respondents were taking insulin by hospital staff. The data related to **Frequency of Insulin** : the majority 33(82.5%) of respondents were taking Insulin 2 times a day and 7(17.5%) of respondents were taking insulin 3 times a day. The data related to **Type of Insulin**: the majority 34(85%) of respondents were taking mixed Insulin, 4(10%) of respondents were taking rapid acting Insulin and remaining 2(5%) of respondents were taking intermediate Insulin.

Table no 3: Mean, median, mode, standard deviation and range of pre-test and post-test Practice scores of Respondents regarding Self-Administration of Insulin

Area of Practice	Number of Items	Mean	Median	Mode	Standard deviation
Pre test scores	20	9.97	10	9	3.03
Post test scores	20	14.82	14.50	12	3.02

The table 3 reveals the pre-test and post-test Practice score of respondents regarding Self-Administration of Insulin. In pretest Practice score, respondents the mean was 9.97, the median was 10, mode was 9 with standard deviation 3.03. In post-test practice score, respondents the mean was 14.82, the median was 14.50, the mode was 12 with standard deviation 3.02.

Table no 4 : Frequency and Percentage distribution of respondents according to level of Practice regarding Self-Administration of Insulin.

	Level of Practice			
	Poor f (%)	**Average f (%)**	**Good f (%)**	**V. Good f (%)**
Pre test	2 (5%)	24 (60%)	13(32.5%)	1(2.5%)
Post test	00	2 (5%)	23 (57.5%)	15 (37.5%)

The table 4**:** reveals the **pre-test** level of practice it shows that maximum 24(60%) respondents had average Practice, 13 (32.5%) respondents had good Practice, 2(5%) had poor Practice and remaining 1(2.5%) of respondents was had Very good practice. & During **post-test** maximum 23(57.5%) of respondents had good Practice, 15(37.5%) of respondents were had Very good Practice and remaining 2(5%) of respondents were had average Practice

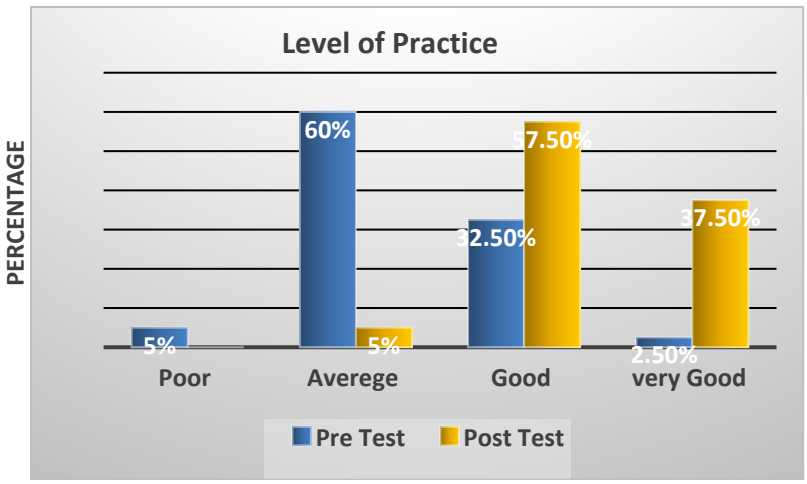

Figure :1 – Pre test & post test level of practice of respondents regarding self -Administration of insulin.

Table no 5 : Mean, standard deviation, and 't' value of pre-test and post-test practice scores regarding Self-Administration of Insulin

Aspects	Mean	Sd	Paired t Test
Pre-test	9.97	3.03	**22.71***
Post-test	14.82	3.02	

The table 5 reveal the result of post-test mean Practice scores was found higher [mean=22.71, SD of 3.02] when compared with pre-test mean practice score value which was 9.97 with SD of 3.03. The statistical

paired 't' implies that the difference in the pretest and post-test value was found statistically significant at 5% level (P<0.05) with a paired 't' value of 22.71. There exists a statistical significance in the difference of practice score indicating of the positive impact of demonstration.

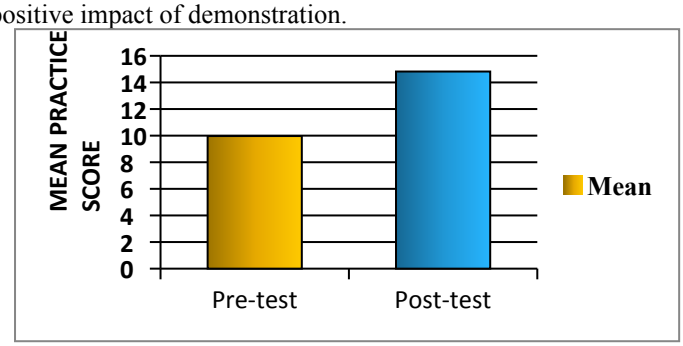

Figure-2 Comparison of Mean Pre -Test and Post - Test Practice score regarding Self -Administration of Insulin

Association between post-test level of Practice with selected socio demographic variables.

In this study the computed Chi-square value for the association between post-test level of practice of respondents regarding self-administration of Insulin and their selected demographic variables is found to be statistically significant at 0.05 level for gender, education and occupation and is not found statistically significant for other selected socio demographic variable's.

Association between post- test level of practice score with Clinical Variables.

In this study the computed Chi-square value for the association between post-test level of practice of respondents regarding self-administration of insulin and their selected clinical variables is found to be statistically significant at 0.05 levels for duration of illness, family history of illness, insulin administration is done by and is not found statistically significant for other selected clinical variables.

IV. Discussion

The present study to assess the effectiveness of demonstration on practice of self-administration of insulin among diabetic patients living in selected community areas of tapi district, Gujarat. Based on the findings of the following conclusion was drawn. Based on the statistical findings it is evident that provision of such demonstration on practice of self-administration of insulin will differentiate the pre-test and post-test level of practice. pre-test level of practice it shows that a maximum 24(60%) respondents had average practice, 13 (32.5%) respondents had good practice, 2(5%) had poor practice and remaining 1(2.5%) of respondents was had very good practice. During post-test maximum 23(57.5%) of respondents were had good practice, 15(37.5%) of respondents had very good practice and the remaining 2(5%) of respondents had average practice.

V. Conclusion

The findings indicates that, the study to assess the effectiveness of demonstration on practice of self-administration of insulin among diabetic patients living in selected community areas of Tapi district, Gujarat. The participants have improved their practice after demonstration of self-administration of insulin.

References

[1]. K Park, "Text book of preventive and social Medicine." 20th edition. Jabalpur: M/s Banarsidas Bhanot; 2009. p 341-42.
[2]. K. Park, "Text book of preventive and social medicine." 22nd edition. M/s banarsidas bhanot publishers 1167, prem Nagar Jabalpur,482 001(M.P.); 2012
[3]. Suresh K. Sharma, "Textbook of nursing research and statistics," 2nd edition, published by; reed Elsevier India private limited, page no. 101-102,138,71,40,206,211,240,262-264,287,290,41.
[4]. Brunner and Suddharth's, "Text Book of Medical- Surgical Nursing," South Asian edition, Volume 2nd, Published by wolters kulwer (India) Pvt. Ltd, new Delhi, Page no-1033,1040-1042
[5]. Annamma Jocob, Rekha R, Jadhav Sonali Tarachand, Book of clinical Nursing Procedure: The Art of Nursing Practice, 2nd Edition, Published by Jaypee Brothers Medical publisher 2019, Page No- 284-286
[6]. Report of the District Medical Office, Mangalore
[7]. Brunton S. Carmichael B, Funnell M. Type 2 diabetes the role of insulin. The Journal of Family Practice Supplement 2005 May.
[8]. Lorber D, Rakel R, Rubin R. Type 2 diabetes the role of insulin: practice recommendations. The Journal of Family Practice Supplement 2005 May.
[9]. Gholamreza Veghari, Mehdi Sedaghat, Hamidreza Joshaghani, Sed Ahmad Hoseini, Farhad Niknezad, Abdolhamid Angizeh, Ebrahim Tazik, Pooneh MoharloeiGolestan: Association between socio-demographic factors and diabetes mellitus in the north of Iran: A population-based study. International Journal of Diabetes Mellitus. Volume 2, Issue 3, December 2010, Pages 154–157
[10]. Stacciarini TS, Pace AC, Haas VJ. Insulin self –administration technique with disposable syringe among patients with diabetes mellitus followed by the family health strategy. Revista Latino-Americana de Enfermagem 2009 Jul 15;17(4).

[11]. Ratnesh Sinha, Angelin Priya, Anuvi Sinha, Mohammad Hifz Ur Rahman, Prevalence of diabetes distress among type 2 diabetes mellitus patients in India: a systematic review and meta-analysis, An Open Access JournalVolume12,2024https://www.tandfonline.com/doi/full/10.1080/21642850.2024.324091

[12]. Kuba Sękowski, Justyna Grudziąż-Sękowska , Jarosław Pinkas, Mateusz Jankowski, knowledge and awareness of diabetes mellitus, its risk factors, complications, and prevention, https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.1029358/full

[13]. Sara Mustafa, Ryan Caul, Rawari Keenan, Dianna Magliano, Lynne Chepulis, Characteristics of Children, Youth, and Young Adults With Diabetes: A Cross-Sectional Study in New Zealand Aotearoa, Journal of Diabetes Research/Volume2024,Issue 1 9968545, https://doi.org/10.1155/jdr/9968545

[14]. Jangra, A., Malik, J. S., Singh, S., & Sharma, N. (2019). Diabetes in rural Haryana, India: A population-based study. Journal of Medical & Allied Sciences, 9(2), 48-54.

[15]. Elhaga Ibrahim Eldesouky Mohamed, AmiraTag Mohamed Mohamed, Heba Gomaa Eldawoody Ali, Rahma Mohamed Mohamed Abd El Rahman, Samia Eaid Elgazzar, Effect of Structured Educational Program on Diabetic Patients' Knowledge Attitude, and Practices Regarding Self-Administration of Insulin Injection, Egyptian Journal of Health Care, June 2024 EJHC Vol 15. No.2

[16]. Ms. Priyanka R. Adhau, A Study to Evaluate the Effectiveness of Demonstration on self-Insulin Administration with Regards to Practice among Diabetes Mellitus Clients in Selected Diabetic Clinics in Metropolitan City, International Journal of Nursing Education and Research, DOI: 10.5958/2454-2660.2017.00039.4 (https://doi.org/10.5958/2454-2660.2017.00039.4)

[17]. Ramakrishna Shabaraya A, Blessy Fernandes, Suchetha Kumari, An Interventional Study to Evaluate Knowledge, Attitude, and Practice Regarding Insulin Administration among Diabetic Patients at a Tertiary Care Hospital Published on: January **2024** Indian Journal of Pharmacy Practice, 2024; 17(1):42-49 doi:10.5530/ijopp.17.1.7 https://ijopp.org/article/1060

[18]. Amit kumar Sen, Mr. Arjun kumar singh, Akanshaverma, Mamta Prajapati, Manoj Kumar Patel, "Effectiveness of instructional demonstration on self-insulin administration technique among diabetes mellitus patients in selected hospitals at Sagar, IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 22, Issue 2 Ser.14 (February. 2023), PP 37-50. www.iosrjournals.org

[19]. Ezhilarasi R, Dr. I Clement, Dr. Babu Darmalingam, Mariam Jaisy and Dr. Sucharitha A International Journal of Midwifery and Nursing Practice 2022; 5(1): 24-28. DOI: https://doi.org/10.33545/26630427.2022.v5.i1a.111 available at. www.nursingpractice.net

[20]. Rajesh Kumar, Effectiveness of Structured Teaching Programme on Knowledge Regarding Self Administration of Insulin among Insulin-Requiring Diabetic Patients in Selected Hospitals of Jaipur, Rajasthan, International Journal of Health Sciences and Research Vol.11; Issue: 1; January 2021 ISSN: 2249-95712021 Website: www.ijhsr.org

[21]. Angelin Dhanalakshmi and Kalavalli, Level Of Knowledge On Self Administration Of Insulin Among Diabetic Patients, World Journal of Pharmaceutical and Life Sciences WJPLS g wjpls, 2020, Vol. 6, Issue 8, 353-357, www.wjpls.org

[22]. Iqra Shafi, Kousar Parveen, Muhammad Hussain, Muhammad Afzal, Muhammad Amir Gilani, Knowledge and practice on self-insulin administration among diabetic patients in tertiary care hospital Lahore. J Intensive Crit Care Nurs. 2020 Volume 3 Issue 3, https://www.alliedacademies.org/journal-intensive-critical-care-nursing/

[23]. Faransa Ali Ahmed, Salwa Ali Marzouk, Safaa Rashad Mahmoud, Effectiveness of Video- assisted Training on Insulin Self-Administration Level among Adolescents with Type 1 Diabetes, International Journal of Nursing Didactics, 8: (07) July (2018). DOI: https://doi.org/10.15520/ijnd.v8i07.2224, available at. www.innovativejournal.in

[24]. Diabetes mellitus [online]. Available from: URL: http://who.int/diabetes mellitus

[25]. Dr J P, Marja and Dr. Das Acharya. Awareness Regarding Self-Care among Diabetics in Rural India. middle east jur of fam med. [Serial online] July 2009[cited on 2016 Jan 30.

[26]. James Norman. Diabetes Introduction. Endocrine web [Serial online] Sep 2009 (Cited on 2016 Jan20). Available from URL:http://www.endocrineweb.com/condition/diabetic

[27]. Diabetes mellitus [online]. Available from: URL:http://asiandiabetes.org

[28]. India to have 57 million diabetics by 2025. Dance with shadow [Serial online] [cited on 2016 Jan 17]. Available from URL: http://www.dURL:http://www.onlinelibrary.wiley,com/doi/10.1002/(SICI)1099-0895(1998090)14:3<227:AID DMR215ancewithshadows.com/business/pharma/india-

[29]. Michele Solimena. Vesicular autoantigens of Type 1 diabetes. Published in online on 1998 dec 21[cited on 2016 Jan 24]. Available from >3.0.CO;2E/abstract.