ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 09, pp.38540-38545, September, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

KNOWLEDGE ATTITUDE AND PRACTICES OF TYPE 2 DIABETICS WITH ULTRASOUND DIAGNOSED NON-ALCOHOLIC FATTY LIVER DISEASE

***Kuhu Roy, Uma Iyer and Tushar Vaishnav**

Department of Foods and Nutrition, the M.S. University of Baroda, Baroda -390002, Gujarat, India

ARTICLE INFO

Article History:
Received 22nd June, 2016
Received in revised form
17th July, 2016
Accepted 29th August, 2016
Published online 30th September, 2016

Key words:

Family planning,
Genetic counselling,
Indications,
Prevention.

ABSTRACT

Introduction: Non-alcoholic fatty liver disease (NAFLD) has detrimental hepatic and cardio-metabolic outcomes in type 2 diabetics. Appropriate self care for holistic disease management is dependent on knowledge attitude and practices (KAP) of the patients. However, there is no data on KAP of type 2 diabetics with NAFLD.

Objective: To assess the KAP of type 2 diabetics with ultrasound diagnosed NAFLD.

Methodology: Information on KAP was elicited with a close ended questionnaire through semi-structured interview method from outpatient type 2 diabetics with ultrasound diagnosed NAFLD (N=60), along with anthropometric and biochemical assessment.

Results: The NAFLD males (n=22) had higher waist hip ratio (0.98 vs. 0.92, P 0.000) and the NAFLD females (n=38) had higher body mass index (30.5 vs. 25.8kg/m2, P 0.000) and low density lipoprotein cholesterol (112.2 vs. 91.2mg/dl, P 0.010). Gender irrespective, majority of the subjects could not define NAFLD (95%), risk factors, diagnosis and treatment modalities for NAFLD (96.6%). Only 5% opined that diabetes might have impacted their liver and 98.3% were unaware about the clinical presentation of NAFLD. The attitude and practice score (7.72 vs. 6.31, P 0.019) and the KAP score of NAFLD males was higher than the NAFLD females (8.3 vs. 6.6, P 0.031), but 95% of the subjects had low KAP score.

Conclusions: Type 2 diabetics with NAFLD had a poor KAP score. Nutrition education for imparting NAFLD knowledge to improvise self care is the need of the hour that may aid in effective holistic management and lead to favourable health outcomes.

Citation: Kuhu Roy, Uma Iyer and Tushar Vaishnav, 2016. "Knowledge attitude and practices of type 2 diabetics with ultrasound diagnosed non-alcoholic fatty liver disease", *International Journal of Current Research*, 8, (09), xxxxxxxxxxx.

INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) is characterised by deposition of triglycerides in the hepatocytes of individuals who do not consume significant amounts of alcohol (Chalasani *et al.,* 2012). The prevalence of NAFLD has increased in the last couple of decades (LaBrecque *et al.,* 2014) and it has become the most common hepatic disease worldwide (Mavrogiannaki *et al.,* 2014). In type 2 diabetics, the prevalence of NAFLD can be alarmingly high, (Chalasani *et al.,* 2012; Ahmed, 2015) that can have detrimental hepatic and cardio-metabolic repercussions (Bhatia *et al.,* 2012). Patients with NAFLD have CVD as the most common cause of mortality (Chalasani *et al.,* 2012; Bhala *et al.,* 2011). Infact, the presence of NAFLD in type 2 diabetics is taken to be a predictor for the development of fibrosis, cirrhosis and eventual liver complications (Oprea-Călin *et al.,* 2014).

****Corresponding author: Kuhu Roy,***
Department of Foods and Nutrition, the M.S. University of Baroda, Baroda -390002, Gujarat, India.

Therefore, holistic management of NAFLD is of utmost importance. From the very few studies that have been conducted to assess the perceptions regarding NAFLD, it has been reflected that the general population, subjects with metabolic risk factors and those afflicted with NAFLD have a poor understanding and inadequate knolwedge about NAFLD as a diseased entity (Leung *et al.,* 2009; Ghevariya *et al.,* 2014; Xue-ying *et al.,* 2014; Wieland *et al.,* 2015; Goh *et al.,* 2016). This lack of knowledge can hinder with effective self care management.Moreover, the perceptions, KAP of the type 2 diabetics exclusively with NAFLD have not been researched so far. Therefore, the study was designed with the objective of assessing the KAP of type 2 diabetes patients with NAFLD.

MATERIALS AND METHODS

It was a cross-sectional study conducted from May, 2013 to July, 2013 in an outpatient diabetic clinic. Subjects with confirmed type 2 diabetes and ultrasound diagnosed NAFLD were enrolled (N=60) upon willingness to participate. Details

regarding the medical history and drug profile were obtained with the help of a semi-structured questionnaire. Body mass index (BMI) was assessed by dividing the weight in kilograms by the square of height in meters. Waist circumference (WC) was measured at the point of the umbilicus with the help of a fibreglass tape. Hip circumference (HC) was measured at the maximum protruding part of the buttocks. Waist hip ratio (WHR) was derived by dividing the WC by the HC. An overnight 12 hours fasting blood sample was obtained for lipid profile, liver enzymes and HbA1c estimation through standard laboratory procedures. In a semi-structured interview, with the help of a pre-tested questionnaire, details regarding the health and nutrition related KAP of type 2 diabetics with NAFLD were obtained. The questionnaire consisted of two major domains; namely, knowledge about NAFLD and attitudes and practices in type 2 diabetes and NAFLD. The close ended questions consisted of yes/no responses or were multiple-choice in nature. A correct response was assigned a score of one, whereas an incorrect response was scored as zero. A summation of the two domains was used to derive the KAP score and the subjects were classifed as having low scores (0-12), average score (12-24) or high score (24-36). The study was approved (IECHR/2013/6) by the Institutional Medical Ethics Committee of the Department of Foods and Nutrition, The Faculty of Family and Community Sciences, The M. S. University of Baroda. Informed, written and understood consent was obtained from the study subjects. The data was entered in micosoft excel worksheets and analysed in SPSS 16.0 version. The continuous variables were presented as mean along with standard deviation (SD). Frequencies of categorical variables were quantified as percentage and subjected to chi square analysis. A confidence interval of 95% was taken. A two tailed p value of <0.05*, P<0.01** and P<0.001*** was considered to be statistically significant.

RESULTS

General profile

The NAFLD males had significantly higher age (59.2 years vs. 54.3 years, P 0.039) and duration of diabetes diagnosis (9.7 years vs. 5.5 years, P 0.023) than the NAFLD females. The subjects had a similar drug profile. Majority of the subjects were graduates (75%), with more males than females. The NAFLD females had a signficantly higher BMI (30.5kg/m2 vs. 25.8 kg/m2, P 0.000), low density lipoprotein cholesterol (112.2mg/dl vs. 91.2mg/dl, P 0.010) and alkaline phosphatase (100.2 vs. 81.5, P 0.0010) than the NAFLD males. The NAFLD males had significantly higher WHR (0.98 vs. 0.92, P 0.000) than the NAFLD females. The liver enzymes were non-significantly higher among NAFLD females (table 1). Knowledge about NAFLD: It was shocking to find that 95% of the subjects could not define/ explain what NAFLD was all about. Meagre 9.09% NAFLD males and 2.63% NAFLD females defined NAFLD as the accumulation of fat in the liver (table 2). An overwhelming 96.7% of the NAFLD subjects were unaware about the risk factors for NAFLD, factors that may lead to progression of NAFLD, correct method of diagnosis and the treatment modalities of NAFLD, with no significant differences in response based on gender. Obesity was not perceived as a risk factor for NAFLD by any of the subjects. Only 5% of the NAFLD subjects perceived that the presence of type 2 diabetes would have an impact on their liver and hence opined that in order to prevent liver related compliations, NAFLD needs to be treated. About 3.3% of the NAFLD subjects perceived that insulin sensitizing drugs and lipid lowering drugs could aid in the treatment of NAFLD. Only a single NAFLD subject stated that NAFLD was an asymptomatic disease, while 98.3% of the NAFLD subjects were unaware about the clinical presentation of NAFLD. About 95% of the subjects were not aware about the necessity for treating NAFLD.

Attitude and practices

Only 41.6% of the NAFLD subjects were satisfied with their current exercise regime, which comprised of more males than the females (54.5% vs. 34.2%, P 0.12) (table 3). Majority of the NAFLD subjects ahered to the dietary restriction of avoiding sweets (96.6%). NAFLD males practiced more caution while eating than the NAFLD females, although non-significant (2.09 vs. 1.73, P 0.10). About 75% of the NAFLD subjects strictly adhered to their drug regime, a practice more common among the NAFLD males than their female counterparts (95.45% vs. 63.15%, P 0.005). Only 15% of the subjects visited the diabetologist on a quarterly basis, with no major gender differences.

Table 1. General profile of type 2 diabetes patients with NAFLD (Mean ± SD, N, %)

Variables	NAFLD Males (N=22)	NAFLD Females (N=38)	Total (N=60)	P value
Age (years)	59.2 ± 8.3	54.3 ± 8.6	56.1 ± 8.5	0.039*
Duration of diabetes (years)	9.7 ± 7.2	5.5 ± 5.8	7.0 ± 6.6	0.023*
Graduates (%)	19 (86.3)	26 (68.4)	45 (75)	0.12
Oral hypoglycemic agents	20 (90.9)	33 (86.84)	53 (88.3)	1
Dyslipidemic agents	6 (27.27)	7 (18.42)	13 (21.6)	0.51
Angiotensin II antagonist agents	5 (22.72)	10 (26.31)	15 (25)	0.75
BMI (kg/m^2)	25.8 ± 4.1	30.5 ± 5.4	28.7 ± 5.4	0.000***
WC (cm)	97.5 ± 9.9	101.4 ± 9.9	99.9 ± 10.0	0.14
WHR	0.98 ± 0.04	0.92 ± 0.05	0.94 ± 0.05	0.000***
TC (mg/dl)	163.7 ± 25.9	188.8 ± 41.5	179.6 ± 38.3	0.0054**
LDL-C (mg/dl)	91.2 ± 25.7	112.2 ± 35.4	104.4 ± 33.5	0.010**
Triglycerides (mg/dl)	153.4 ± 74.7	133.4 ± 62.4	140.7 ± 67.3	0.29
HDL-C (mg/dl)	41.8 ± 9.8	49.9 ± 8.5	46.9 ± 9.7	0.0014**
HbA1c (%)	7.9 ± 1.7	8.3 ± 1.7	8.2 ± 1.7	0.35
Alkaline phosphatase (U/L)	81.5 ± 21.8	100.2 ± 19.3	93.3 ± 21.9	0.0010**
GGT (U/L)	25.7 ± 9.1	29.9 ± 15.2	28.4 ± 13.4	0.18
SGOT (U/L)	21.5 ± 7.6	22.9 ± 10.8	22.4 ± 9.7	0.58
SGPT (U/L)	24.5 ± 9.7	25.9 ± 15	25.5 ± 13.3	0.65
Total protein (g/dl)	7.3 ± 0.4	7.5 ± 0.42	7.5 ± 0.41	0.08
Albumin (g/dl)	4.3 ± 0.24	4.2 ± 0.31	4.2 ± 0.29	0.20

P<0.05*, P<0.01**, P<0.001***, figures in parenthesis depict percentage

Table 2. Knowledge about NAFLD among type 2 diabetes patients with NAFLD (N, %)

Aspects	Responses	NAFLD Males (N=22)	NAFLD Females (N=38)	Total (N=60)	P value
Definition of NAFLD	Fat accumulation in liver	2 (9.09)	1 (2.63)	3 (5)	0.54
	Do not know	20 (90.9)	37 (97.36)	57 (95)	0.54
Risk factors for NAFLD	Obesity	0 (0)	0 (0)	0 (0)	-
	IR / T2DM	1 (4.54)	0 (0)	1 (1.6)	0.36
	Hypertension	0 (0)	1 (2.63)	1 (1.6)	1
	Altered lipid profile	0 (0)	1 (2.63)	1 (1.6)	1
	Surgery	0 (0)	1 (2.63)	1 (1.6)	1
	Hepatotoxic drugs	0 (0)	1 (2.63)	1 (1.6)	1
	Do not know	21 (95.45)	37 (97.36)	58 (96.6)	1
Impact of diabetes on liver	Yes	2 (9.09)	1 (2.63)	3 (5)	0.54
	No	6 (27.3)	5 (13.2)	11 (18.3)	0.18
	Do not know	14 (63.6)	32 (84.2)	46 (76.6)	0.07
Progression of NAFLD	Diet rich in sugars	0 (0)	0 (0)	0 (0)	-
	Diet rich in fats	0 (0)	0 (0)	0 (0)	-
	Insulin resistance	1 (4.54)	1 (2.63)	2 (3.3)	1
	Do not know	21 (95.45)	37 (97.36)	58 (96.6)	1
Clinical presentation of NAFLD	Asymptomatic	0 (0)	1 (2.63)	1 (1.6)	1
	Fatigue	0 (0)	0 (0)	0 (0)	-
	Abdominal discomfort	0 (0)	0 (0)	0 (0)	-
	Do not know	22 (100)	37 (97.36)	59 (98.3)	1

Figures in parenthesis indicate percentage

Table 2. Knowledge about NAFLD among type 2 diabetes patients with NAFLD (N, %)

Aspects	Responses	NAFLD Males (N=22)	NAFLD Females (N=38)	Total (N=60)	P value
Diagnosis of NAFLD	Ultrasound	1 (4.54)	1 (2.63)	2 (3.3)	1
	Liver function test	0 (0)	0 (0)	0 (0)	-
	Lipid profile	0 (0)	0 (0)	0 (0)	-
	Do not know	21 (95.45)	37 (97.36)	58 (96.6)	1
Need for treating NAFLD	Prevent liver complication	2 (9.09)	1 (2.63)	3 (5)	0.54
	Prevent heart disease	1 (4.54)	0 (0)	1 (1.6)	0.36
	Prevent diabetes complications	0 (0)	0 (0)	0 (0)	-
	Do not know	20 (90.9)	37 (97.36)	57 (95)	0.54
Treatment modalities of NAFLD	Weight control	0 (0)	0 (0)	0 (0)	-
	Balanced diet	0 (0)	0 (0)	0 (0)	-
	Insulin sensitizing drugs	1 (4.54)	1 (2.63)	2 (3.3)	1
	Fat lowering drugs	1 (4.54)	1 (2.63)	2 (3.3)	1
	Physical activity	1 (4.54)	0 (0)	1 (1.6)	0.36
	Do not know	21 (95.45)	37 (97.36)	58 (96.6)	1

Figures in parenthesis indicate percentage

Table 3. Attitude and practice of type 2 diabetes patients with NAFLD (N, %)

Questions	Responses	NAFLD Males (N=22)	NAFLD Females (N=38)	Total (N=60)	P value
Exercise satisfaction	Yes	12 (54.54)	13 (34.2)	25 (41.6)	0.12
	No	10 (45.45)	25 (65.7)	35 (58.3)	0.12
Dietary restrictions	Avoid sweets	22 (100)	36 (94.73)	58 (96.6)	0.52
	Avoid sweet fruits	13 (59.09)	20 (52.63)	33 (55)	0.63
	Avoid fatty, oily food	11 (50)	10 (26.31)	21 (35)	0.06
Regularity in medication	Yes	21 (95.45)	24 (63.15)	45 (75)	0.005**
	No	1 (4.54)	14 (36.84)	15 (25)	0.005**
Visit to diabetologist	Once in 3 months	4 (18.18)	5 (13.15)	9 (15)	0.71
	Once in 6 months	10 (45.45)	20 (52.63)	30 (50)	0.59
	Once in a year	3 (13.63)	7 (18.42)	10 (16.6)	0.63
	Once in 2 years	5 (22.72)	6 (15.78)	11 (18.3)	0.51
FBS estimation	Fortnightly	2 (9.09)	2 (5.26)	4 (6.6)	0.61
	Once a month	10 (45.45)	15 (39.47)	25 (41.6)	0.65
	Once in 2 months	5 (22.72)	11 (28.94)	16 (26.6)	0.60
	Once in 3 months	5 (22.72)	10 (26.31)	15 (25)	0.75
HbA1c estimation	Once in 6 months	11 (50)	10 (26.31)	21 (35)	0.06
	Once in a year	8 (36.36)	18 (47.36)	26 (43.3)	0.41
	Once in 2 years	3 (13.63)	10 (26.31)	13 (21.6)	0.33

Figures in parenthesis indicate percentage

A little less than half of the subjects (48.2%) estimated their fasting blood sugar levels on a monthly basis. Only 35% of the subjects got their HbA1c estimated bi-annually, with more NAFLD males than the NAFLD females in the said category (50% vs. 26.3%, P 0.06).

About 64% of the NAFLD subjects monitored their blood pressure within a fortnight span. With respect to lipid profile and renal profile, 83% of the NAFLD subjects had them evaluated atleast on an annual basis, with no major differences. A little more than half of the NAFLD subjects (51.6%) visited the opthalmologist yearly.

Table 3. Attitude and practice of type 2 diabetes patients with NAFLD (N, %)

Questions	Responses	NAFLD Males (N=22)	NAFLD Females (N=38)	Total (N=60)	P value
BP monitoring	Weekly	7 (31.81)	7 (18.42)	14 (23.3)	0.24
	Fortnightly	9 (36.36)	16 (42.1)	25 (41.6)	0.92
	Once a month	1 (4.54)	4 (10.52)	5 (8.3)	0.64
	Once in 2 months	4 (18.18)	8 (21.05)	12 (20)	1
	Once in 3 months	2 (9.09)	3 (7.89)	5 (8.3)	1
Lipid profile estimation	Once in 6 months	10 (45.45)	11 (28.94)	21 (35)	0.20
	Once in a year	10 (45.45)	19 (50)	29 (48.3)	0.73
	Once in 2 years	2 (9.09)	8 (21.05)	10 (16.6)	0.29
Kidney profile estimation	Once in 6 months	10 (45.45)	11 (28.94)	21 (35)	0.20
	Once in a year	10 (45.45)	19 (50)	29 (48.3)	0.73
	Once in 2 years	2 (9.09)	8 (21.05)	10 (16.6)	0.29
Visit to the opthalmologist	Once in a year	9 (40.9)	22 (57.89)	31 (51.6)	0.20
	Once in 2 years	11 (50)	8 (21.05)	19 (31.6)	0.02*
	Never	2 (9.09)	8 (21.05)	10 (16.6)	0.29

Figures in parenthesis indicate percentage

Table 4. Knowledge attitude and practice score of type 2 diabetics with NAFLD (Mean ± SD, N, %)

Variables	Score range	NAFLD Males (N=22)	NAFLD Females (N=38)	Total (N=60)	P value
NAFLD knowledge	0-24	0.54 ± 1.6	0.23 ± 1.4	0.35 ± 1.5	0.46
Low	0-8	22 (100)	37 (97.4)	59 (98.3)	1
Average	8-16	0 (0)	1 (2.6)	1 (1.7)	1
Good	16-24	0 (0)	0 (0)	0 (0)	-
Attitude and practices	0-12	7.72 ± 2.16	6.31 ± 2.21	6.8 ± 2.3	0.019*
Low	0-4	1 (4.54)	3 (7.89)	4 (6.6)	1
Average	4-8	10 (45.45)	24 (63.15)	34 (56.6)	0.18
Good	8-12	11 (50)	11 (28.9)	22 (36.6)	0.10
KAP	0-36	8.3 ± 2.9	6.6 ± 2.7	7.2 ± 2.9	0.031*
Low	0-12	21 (95.45)	36 (94.7)	57 (95)	1
Average	12-24	1 (4.54)	2 (5.3)	3 (5)	1
Good	24-36	0 (0)	0 (0)	0 (0)	-

P<0.05*, P<0.01**, P<0.001***, figures in parenthesis depict percentage

However, more of the NAFLD males went to the opthalmologist once in two years compared to the NAFLD females (50% vs. 21.05%, P 0.02).

KAP score

The mean NAFLD knowledge score was in the poor category, irrespective of the gender. About 98.3% of the NAFLD subjects had poor NAFLD knowledge score, comprising of all the males and 97.4% of the females. The mean attitudes and practice score of NAFLD males was signficantly higher than the NAFLD females (7.72 vs. 6.31, P 0.019) and was falling in the average category. Good scores were more prevalent in the NAFLD males than the NAFLD females (50% vs. 28.9%, P 0.10). Overall, the mean KAP score of the NAFLD males was significantly higher than the NAFLD females (8.3 vs. 6.6, P 0.031), although both had the mean score falling in the poor category. About 95% of the NAFLD subjects had KAP score in the poor category (table 4).

DISCUSSION

NAFLD is an under-recognised disease that is postulated to impact the rich and the poor economies alike as its prevalence has doubled in the last two decades and that of other CLDs has either stabilised or decreased (LaBrecque *et al.,* 2014). As type 2 diabetics have reportedly high prevalence of NAFLD, (Chalasani *et al.,* 2012; Ahmed, 2015) NAFLD needs attention as a serious metabolic co-morbidity as it is associated with the presence of more severe forms of NASH (Oprea-Călin *et al.,* 2014) and CVD is the leading cause of mortality in these subjects (Chalasani *et al.,* 2012).

From the meagre data that is available, awareness regarding NAFLD in different target populations has been found to be poor. Since very little stands known about the perceptions regarding NAFLD among those afficlited with the said chronic disease, the present research was conducted to assess the health and nutrition related knowledge attitude and practices of type 2 diabetes patients with NAFLD. It was surprising to find that the awareness regarding NAFLD was alarmingly low in type 2 diabetics. Similar findings were obtained from a study that was conducted in the United States wherein from a general population of 5000, 84% were unaware about the risk factors for NAFLD and another 93% had no clue as how NAFLD could be diagnosed (Ghevariya *et al.,* 2014). However, in the present study, unawareness about factors that predispose to NAFLD and its diagnosis was as high as 96.6%. Also, the perception regarding the need for treating NAFLD was very low in the present study wherein only 5% cited prevention of liver complications and another meagre 1.6% felt the necesity to treat NAFLD in order to prevent cardiac issues. This strongly indicates the need to educate and inform the patients of the cardiac and hepatic consequences of neglect of NAFLD. Perceptions of consequences of NAFLD were far better understood in the US general population wherein 95% had opined that hepatic fat deposition would cause serious health problems (Ghevariya *et al.,* 2014). In a KAP study among the Harbin residents, the NAFLD subjects displayed lack of knowledge regarding NAFLD and also their practices were signficantly lower compared to the general population (Xue *et al.,* 2014). Poor awareness levels regarding NAFLD were also reported among subjects with high metabolic risk factors in a study conducted on individuals with and without metabolic risk

factors in an outpatient clinical setting (Wieland *et al.,* 2015). In a general population telephonic survery study in Hong Kong, about 47% of the subjects had no idea about the clinical presentation of NAFLD and an overwhelming 78% reported that blood tests could be used to diagnose NAFLD (Leung *et al.,* 2009). In the present research, the figures were much more deplorable as 98.3% of the subjects could not figure out about the clinical presentation of NAFLD and 96.6% were clueless about NAFLD's correct diagnosis. Such alarming levels of unawareness about NAFLD as a diseased condition calls for urgent need for nutrition education in order to give due importance to this CLD that can have devastating health consequences. Nutrition education can empower the subjects with knowledge that can be further translated into healthy attitudes and doable practices, hence bring about a signficant change in KAP. Increasing knowledge in patients with liver disease has the potential to affect behavioural change favourably, enhance patient self efficacy and retard disease progression (Singal *et al.,* 2011). Other studies on KAP in relation to NAFLD have strongly advocated the need for nutrition education in order to strengthen NAFLD related knowledge, especially among those afflicted with NAFLD (Xue *et al.,* 2014; Wieland *et al.,* 2015; Goh *et al.,* 2016) and provide education to high-risk individuals with the goal of implementing early prevention strategies and optimizing care (Wieland *et al.,* 2015). Educating the patients about the nature of the liver disease may aid in the effective management of NAFLD (Wainwright, 2015). Moreover, targeting the modifiable factors for knowledge imporvement may have a significant impact on retarding liver disease progression and improving the treatment outcomes (Valery *et al.,* 2015). About $3/4^{th}$ of the NAFLD subjects followed their prescribed drug regime strictly and only 48% estimated fasting blood sugar on a regular basis and about 63% monitored blood pressure frequently. In order to improve these practices, the need for patient education is again getting highlighted as nutrition counselling can enhance self monitoring of fasting blood sugar, blood pressure and improve compliance to medication (Devins *et al.,* 2005). Imparting knowledge also leads to improved treatment adherence that facilitates effective decision making, which leads to reduced health care costs and improved health outcomes in the long run (Devins *et al.,* 2005).

To our knowledge, this is the first study to have assessed the KAP of the type 2 diabetics with NAFLD. Since personal interviews were conducted for eliciting the information rather than a self administered questionnaire, it allowed the scope for probing the patients. The study was delimited to the patients only and the KAP of the physicians was not assessed, which was a signficant disadvantage. Previous studies have revealed that the general practitioners have bare adequate knowledge about NAFLD, (Grattagliano *et al.,* 2008; Said *et al.,* 2013) which could possibly have been one of the reasons for the perceived non-importance of NAFLD as a diseased entity in the present study. To conclude, the type 2 diabetics with NAFLD had poor health and nutrition related KAP, irrespective of the gender. This calls for an urgent need to spread awareness about NAFLD as a neglected co-morbidity in the type 2 diabetics that can have deleterious consequences. Nutrition counselling can be a viable strategy for educating the patients to prevent the progression of NAFLD and to strive for holistic self care of the patients.

Acknowledgements

The authors would like to thank the University Grant Commission, New Delhi, India for providing Senior Research Fellowship to Ms. Kuhu Roy. This research is a part of the doctoral work of Ms. Kuhu Roy that has been submitted to the M.S. University of Baroda, Gujarat, India.

REFERENCES

Ahmed, M. 2015. Non-alcoholic fatty liver disease in 2015. *World J Hepatol*., 7: 1450-1459.

Bhala, N., Angulo, P., van der Poorten, D., *et al*. 2011. The natural history of nonalcoholic fatty liver disease with advanced fibrosis or cirrhosis: an international collaborative study. *Hepatology*, 54: 1208–1216.

Bhatia, L.S., Curzen, N.P., Calder, P.C., *et al*. 2012. Non-alcoholic fatty liver disease: a new and important cardiovascular risk factor? *Eur Heart J*., 33: 1190–1200.

Chalasani, N., Younossi, Z., Lavine, J.E., *et al*. 2012. The Diagnosis and Management of Non-Alcoholic Fatty Liver Disease: Practice Guideline by the American Association for the Study of Liver Diseases, American College of Gastroenterology, and the American Gastroenterological Association. AASLD practice guideline. *Hepatology*, 55: 2005-23.

Devins, G.M., Mendelssohn, D.C., Barre, P.E., *et al*. 2005. Predialysis psychoeducational intervention extends survival in CKD: a 20-year follow-up. *Am J Kidney Dis*., 46: 1088–98.

Ghevariya, V., Sandar, N., Patel, K., *et al*. 2014. Knowing what's out there: awareness of non-alcoholic fatty liver disease. *Front. Med*., 1: 1-5.

Goh, G.B.B., Kwan, C., Lim, S.Y., *et al*. 2016. Perceptions of non-alcoholic fatty liver disease- an Asian community-based study. *Gastroenterol. Rep*., 4:131-135.

Grattagliano, I., D'Ambrosio, G., Palmieri, V.O., *et al*. 2008. Improving Nonalcoholic Fatty Liver Disease Management by General Practitioners: a Critical Evaluation and Impact of an Educational Training Program. *J Gastrointestin Liver Dis.,* 17: 389-394.

LaBrecque, D.R., Abbas, Z., Anania, F., *et al*. 2014. World Gastroenterology Organisation Global Guidelines Nonalcoholic Fatty Liver Disease and Nonalcoholic Steatohepatitis. *J Clin Gastroenterol*, 48: 467-473.

Leung, C.M., Lai, L.S., Wong, W.H., *et al*. 2009. Non-alcoholic fatty liver disease: an expanding problem with low levels of awareness in Hong Kong. *J Gastroenterol Hepatol.,* 24: 1786-90.

Mavrogiannaki, A.N., Migdalis, I.N. 2013. Nonalcoholic Fatty Liver Disease, Diabetes Mellitus and Cardiovascular Disease: Newer Data. *International Journal of Endocrinology,* 450639:1-8.

Oprea-Călin, G., Babeş, P.A., Andronescu, D.V., *et al*. 2014. Connection between non-alcoholic fatty liver disease and diabetes mellitus. *Romanian Journal of Diabetes Nutrition and Metabolic Diseases*, 21:121–127.

Said, A., Gagovic, B., Malecki, K., *et al*. 2013. Primary care practitioners survey of non-alcoholic fatty liver disease. *Ann Hepatol*, 12: 758-65.

Singal, A.G., Volk, M.L., Rakoski, M.O., *et al*. 2011. Patient involvement in healthcare is associated with higher rates of

surveillance for hepatocellular carcinoma. *J Clin Gastroenterol,* 45: 727–32.

Valery, P.C., Powell, E., Moses, N., *et al*. 2015. Systematic review: unmet supportive care needs in people diagnosed with chronic liver disease. *BMJ Open*, 5: e007451.

Wainwright, P. 2015. Non-alcoholic fatty liver disease and type 2 diabetes: An overview of the problem. *Journal of Diabetes Nursing,* 19: 195–9.

Wieland, A.C., Mettler, P., McDermott, M.T., *et al*. 2015. Low awareness of nonalcoholic fatty liver disease among patients at high metabolic risk. *J Clin Gastroenterol*, 49: e6-e10.

Xue-ying, F., Quan-sen, Z., Hong-xiang, Z., *et al*. 2014. Survey on knowledge, attitude and practice (KAP) of nonalcoholic fatty liver diseases among residents in Harbin. *Chinese Journal of Public Health Management*, 01: 103-105.