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Impact of Clinical Pharmacist-Led Interventions on Short Term Quality of Life Among Iraqi Patients with Multiple Sclerosis Taking Disease-Modifying Therapy

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Abstract

Multiple sclerosis has a substantial impact on a patient's quality of life. Pharmacists have a significant effect on the treatment of people with multiple sclerosis (MS) and may contribute to enhancing their quality of life (QoL). This study aims to evaluate the efficacy of pharmacist-led intervention (PI) on the quality of life (QoL) of patients with multiple sclerosis taking disease-modifying therapies (DMTs). This was a pre-post-intervention study on patients with Relapsing-remitting multiple sclerosis and receiving DMTs who attended a neurological consultant clinic in the medical city of Baghdad. Each patient received two educational sessions: the first at baseline after filling the face validation Arabic version of Multiple Sclerosis Quality of Life (MSQOL) -29 items at baseline and the second after a month. Each session lasted approximately 30-45 minutes, and the patients received educational counselling. A formal Arabic pamphlet was prepared for each patient. Then, after two months, the researcher asked the patient to refill the same questionnaires. Eighty patients with RRMS were enrolled in the study, and sixty-five of these patients ultimately completed the study. The mean age of the participants is 30.64 ±8.54. The clinical pharmacist's intervention significantly improved the physical health composite PHC and mental health composite MHC. Only physical function in PHC and changes in health were non-significantly affected by pharmacist intervention. The changes in scores before and after intervention were non-significant differences in all demographic data groups. Finally, the study concluded that a clinical pharmacist-led educational intervention may enhance the quality of life of multiple sclerosis patients.

Keywords: Disease modifying therapy, Multiple sclerosis, Clinical Pharmacist Led-Intervention, Pharmacist care and Quality of life.

Introduction

Multiple sclerosis (MS) is an autoimmune disease that is characterized medically as a demyelinating nervous system disease.[(1)] MS prevalence differ by different geographic regions .Iraq as a part of the Middle East area was considered as a MS medium risk prevalence area.(2) In 2020, 4355 people live with MS in Iraq, of which 69% are women.[(3)] Multiple sclerosis (MS) has a major impact on a patient's quality of life.[(4)] When compared to non-diseased and diseased populations, MS patients have a wide variety of functional deficits and progressive disabilities, resulting in a worse quality of life.[(5)] Health-related quality of life (HQoL) is defined as the ability to enjoy substantial behaviour despite the disease.[(6)] HRQoL is an important measure to evaluate the impact of a chronic disease such as MS.[(7)] Disease modifying therapys (DMTs) can improve patients' HQoL by reducing relapses and disease activity.[(8)] Furthermore, difficulties associated with repeated injections or side effects of oral medicines may have a negative influence on patients' HQoL.[(8)] Pharmacists play an essential role in the care of patients with MS and help to improve their quality of life (QoL).[(9,10)] Pharmacists also function as drug information experts, performing drug utilization assessments and advising on prescription selection and dose.[(11)] They also cooperate with other healthcare experts to improve patient results.[(12)] Evidence shows that pharmacist interventions enhance MS patients' short-term quality of life.[(13,14)] A study based on the pre-post approach sought to improve the quality of life of patients with multiple sclerosis.[(13,14)] The study includes identifying the factors influencing MS patients' quality of life, prioritizing these elements, and finding the behavioural and environmental factors that have the most significant impact.[(14)] Improving multiple sclerotic patients' awareness of their drugs may enhance treatment adherence and acceptability, as well as QoL.[(15)] Many studies have been conducted

to assess the patient benefits of pharmacist intervention (PI) in neurology clinics worldwide.[15–18] There is also a lot of research on assessing MS patients' quality of life.[2,19–22] Many studies have been conducted in Iraq to investigate the effectiveness of pharmacist-led intervention and interprofessional collaboration (a physician-pharmacist partnership) in various medical conditions. The pharmacist's function was helpful and valuable in these investigations.[23–29] To increase pharmacist involvement in this field, the current study extended the positive findings from these studies on other diseases to patients with multiple sclerosis. There was no previous study in Iraq to evaluate the efficacy of pharmacist-led interventions on patient quality of life among adult patients with multiple sclerosis. The current study aims to evaluate the efficacy of pharmacist-led intervention (PCI) on the quality of life (QoL) of patients with multiple sclerosis taking DMTs.

Materials and Methods

Study Design: This was a pre-post-intervention study on a convenient sample of MS patients diagnosed by specialists with Relapsing-remitting multiple sclerosis (RRMS) and receiving DMTs who attended a neurological consultant clinic in the medical city of Baghdad between November 2023 and March 2024.

Study population: The study was carried out on patients already diagnosed by specialists with relapsing-remitting multiple sclerosis and taking DMTs for at least six months (to ensure the effectiveness and response of the drug) but no more than two years, Patients 18 years and older who attended a neurological consultant clinic in the medical city of Baghdad, and Patient must accept to participate in the study. The exclusion criteria were: Patient who has hearing, speech or cognitive deficits that would impair understanding of the questions and receiving the education, Women who are pregnant or breastfeeding (These cases may affect relapse), Multiple sclerotic patients who have been diagnosed with other types of MS, Patients had Co-morbidities that may affect the results and Patients providing incomplete information during the completion of the questionnaire also will be excluded from the study.

Study process: Firstly, we determined the baseline level of QoL by asking the patients to complete the structured questionnaire of Multiple Sclerosis Quality of Life (MSQOL)-29 items. After that, the patients received educational counseling. We prepared a reference pamphlet translated into a formal Arabic language for each patient. Five PhD-holding faculty members in the Department of Clinical Pharmacy, College of Pharmacy, University of Baghdad's scientific committee examined and evaluated the pamphlet (The face validation led to acceptance and approval of the translation process after some suggestion to change some terms to be more understandable by Iraqi patients). The pamphlet contained the following medical information: (1) Information on DMTs and MS, (2) The purpose of DMTs, (3) The prevention and management of adverse drug reactions, (4) Dietary and nonpharmacological advice, and (5) Cautions and drug interactions with DMTs. Each participating patient received an educational aid (an educational pamphlet). Comprehensive pharmaceutical counselling includes face-to-face and phone-based educational sessions. The researcher was kept in complete contact with patients via mobile phone. Educational sessions: Each patient received two educational sessions: the first at baseline and the second after a month. Each session lasted for approximately 30-45 minutes. In addition, the patients could chat with the clinical pharmacists during all the periods. Patients filled out the questionnaires (about QoL) at baseline before the educational session. Then, after two months, the researcher asked the patient to refill the same questionnaires to determine the degree of improvement in quality of life. The educational counselling session will include the following information: (1) Information about MS and its symptoms, (2) Information about the drug that the patient used (importance, route of administration, adverse effects, and how to reduce/ prevent them), and (3) Counseling about adherence and how to prevent intentional non-adherence. The study flow chart is presented in the Figure1.

Data Collection and study instruments

Data on demographics and clinical characteristics were collected. The face validation Arabic version of Multiple Sclerosis Quality of Life (MSQOL)-29 items was used. A face-validated (by a panel of experts of five PhD-holding faculty members in the Department of Clinical Pharmacy, College of Pharmacy, University of Baghdad scientific committee) Arabic version of the Questionnaire about MSQOL was created (The face validation led to acceptance and approval of the translation process after some suggestion to change some terms to be more understandable by Iraqi patients). The MSQOL-29 is a condensed version of the MSQOL-54 item. It has seven multi-item subscales: physical function (6 items), sexual function (4 items), bodily pain (3 items), emotional well-being (3 items), energy (3 items), cognitive function (3 items), and health distress (3 items). It also has four single-item subscales: social function, health perceptions, overall quality of life, and change in health. These subscales comprise two composite scores: the physical health composite (PHC) and the mental health composite (MHC).[30]As weighted sums of the appropriate subscales, MHC and PHC scores were calculated by analogy with those of the MSQOL54.[30] Scores of all scales and two composites, ranging from 0 to 100. The higher

scores imply a better situation. Calculation of score:
Final scale score = average of score.
PHC = Summation of (final scale score multiplied by weight number).
MHC = Summation of (final scale score multiplied by weight number).
Scales for PHC: physical function, health perception, energy, bodily pain, sexual function, social function, and health distress.Scales for MHC: health distress, overall QoL, emotional well-being, and cognitive function. ***Statistical Analysis:*** The statistical package for the social sciences software SPSS (version 26.0) was used to analyze all the data. Continuous variables were expressed in mean ± standard deviation, while categorical variables were expressed as number and frequency. A Shapiro–Wilk test was used to test the normality of the results. A paired *t*-test and Wilcoxon signed ranks test were used to compare the changes before and after the clinical pharmacist intervention. Mann-Whitney test, independent t-test, Kruskal Wallis test, and one-way ANOVA were used to compare the differences between demographic data groups. A probability that less than 0.05 was considered significant.

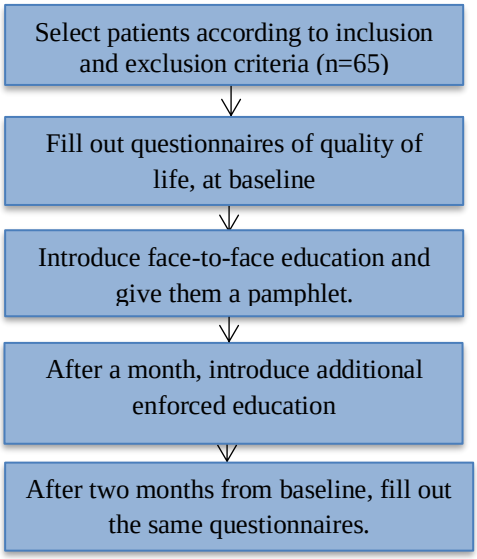

Figure1.The study flow chart.

Results and Discussion

Results

Eighty patients with RRMS were enrolled in the study, and sixty-five of these patients ultimately completed the study. The response rate was 81.25%. Fifteen of them continuously received phone counseling, and the rest of the patients did not contact me. They were assured that the pamphlet and information were clear and understandable in the second session. Regarding the follow-up questionnaire (MSQOL-29 items), the internal consistency (Cronbach's alpha coefficient) used to assess instrument reliability was estimated at 0.85. The scale has effectively achieved convergent validity in all aspects. Additionally, regarding the pamphlet, we were displaying our designed pamphlet to some neurologists. Neurologists who read the pamphlet said it would minimize their burden and boost patients' awareness about their disease and treatment, leading to increased adherence. The mean age of the participants is 30.64 ±8.54. As shown in Table 1, most patients were female, married, had high levels of education, resided in Baghdad, and had natalizumab and interferon beta as their current treatments.

Table 1. Demographic and clinical characteristics.

Variable		Number		Percentage %
Age	(18-29)	33		52.30
	(30-39)	23		35.38
	(40-49)	5		7.69
	(50-59)	4		4.61
Sex	Male	Married	12	18.46
		Unmarried	8	12.30
	Female	Married	26	40.00
		Unmarried	19	29.23

Educational level	Primary	7	10.76
	Middle	9	13.84
	Secondary	15	23.07
	University	34	52.30
Residency	Baghdad	46	70.76
	Other provinces	19	29.23
Treatment	Interferon beta	20	30.76
	Fingolimod	5	7.69
	Natalizumab	35	53.84
	Rituximab	5	7.69

The clinical pharmacist's intervention significantly improved the physical health composite PHC and its scales (Health perception, Energy, Sexual function, and Social function) and the mental health composite MHC and its scales (Overall quality of life, Emotional well-being, Cognitive function) in QOL data ($P < 0.05$) (Table 2). Following the intervention, the PHC (Bodily pain and health distress) and MHC (health distress) scales showed substantial decreases ($P < 0.05$, Table 2). However, only physical function in PHC and a single item of change in health (for only some patients) were non-significantly affected by the intervention. ($P > 0.05$, Table 2).

Table 2. Scores of all scales and items of the MSQoL-29 questions before and after the pharmacist-led intervention (PI)

The quality-of-life scale		**Before PI**	**After PI**	***P****
		Mean±SD	**Mean±SD**	
QoL composites	Physical function composite	49.92±13.83	57.56± (11.10)	0.000#
	Mental function composite	42.52±10.80	47.51±10.15	0.000#
Change in health		68.75±29.50	68.05±20.36	0.939
Physical function composite	Physical function	66.43±23.69	69.44±21.73	0.072
	Health perception	64.58±23.43	76.38±19.77	0.000#
	Energy	38.87±12.44	55.74±9.44	0.000#
	Bodily pain	63.03±22.72	72.02±17.96	0.000#
	Sexual function	67.17±31.00	76.85±25.37	0.011#
	Social function	52.77±25.89	65.27±20.06	0.002#
	Health distress	42.96±24.34	53.88±21.40	0.001#
Mental function composite	Health distress	42.96±24.34	53.88±21.40	0.001#
	Overall QoL	67.77±17.90	72.15±14.94	0.027#
	Emotional well-being	60.71±13.85	65.53±13.77	0.004#
	Cognitive function	43.89±22.23	50.37±20.68	0.001#

⁎ Within group comparison (before versus after study scores), Paired t-test and Wilcoxon signed ranks test.

P-value less than 0.05 considered significant. **PI.** Pharmacist intervention **SD**. Standard déviation.

The changes in scores after and before intervention in both composites of QoL had non-significant differences between age groups (p-value> 0.05) (table 3).

Table 3. Changes in scores between before and after the pharmacist-led intervention (PI), and relation with age

QoL composites	**Mean±SD**	**Age**	**Mean±SD**	**P***
Physical health composite score change (after-before)	8.54±9.50	(18-29)	10.94±8.05	0.431
		(30-39)	6.83±7.16	
		(40-49)	9.87±6.09	
		(50-59)	4.72±5.63	
Mental health composite score change (after-before)	4.98±8.20	(18-29)	5.02±8.91	0.979
		(30-39)	5.33±8.22	
		(40-49)	3.64±7.07	
		(50-59)	4.35±4.71	

⁎ Within group comparison (changes between after and before versus age), Physical health composite: Kruskal Wallis test and Mental heal composite: One-way ANOVA. **SD**.Standard deviation.

In addition, the changes in scores also had non-significant differences between sex groups (p value>0.05) (Table 4).

Table 4. Changes in scores between before and after the pharmacist-led intervention (PI), and relation with sex

QoL composites	Mean±SD	Sex	Mean±SD	P*
Physical health composite score change (after-before)	8.54±9.50	Male	3.33±6.07	0.972
		Female	6.87±8.85	
Mental health composite score change(after-before)	4.98 ±8.20	Male	6.61±8.76	0.290
		Female	4.26±7.94	

* Within group comparison (changes between after and before versus sex), Physical health composite: Mann-Whitney test and Mental heal composite: Independent t-test. **SD**.Standard deviation.

The change scores had non-significant differences with social status (p value>0.05) (Table 5).

Table 5. Changes in scores between before and after the pharmacist-led intervention (PI), and relation with social status

QoL composites	Mean±SD	Social status	Mean±SD	P*
Physical health composite score change (after-before)	8.54±9.50	Married	10.46±9.29	0.149
		unmarried	2.69±6.28	
Mental health composite score change(after-before)	4.98 ±8.20	Married	5.25±7.86	0.760
		Unmarried	4.61±8.80	

∗ Within group comparison (changes between after and before versus duration of social status), Physical health composite: Mann-Whitney test and Mental heal composite: Independent t-test. SD. standard deviation. Intervention by pharmacist had non-significant differences between level of education (p value>0.05) (Table 6).

Table6. Changes in scores between before and after the pharmacist-led intervention (PI), and relation with educational level

QoL composites	Mean±SD	Educational level	Mean±SD	P*
Physical health composite score change (after-before)	8.54±9.50	Primary	12.51±15.85	0.990
		Middle	7.58±7.08	
		High	7.84±6.72	
		University	4.38±3.45	
Mental health composite score change(after-before)	4.98 ±8.20	Primary	6.64±6.52	0.340
		Middle	8.95±9.09	
		High	4.48±10.25	
		University	3.75±7.07	

* Within group comparison (changes between after and before versus educational level), Physical health composite: Kruskal Wallis test and Mental heal composite: One-way ANOVA. **SD**. Standard deviation.

Also, there are non-significant differences between the type and duration of the current treatment (p value>0.05) (Table 7 and Table 8).

Table 7. Changes in scores between before and after the pharmacist-led intervention (PI), and relation with type of treatment

QoL composites	Mean±SD	Treatment	Mean±SD	P*
Physical health composite score change (after-before)	8.54±9.50	Natalizumab	8.833±8.83	0.938
		Interferon beta	7.85±8.18	
		Fingolimod	6.38±6.99	
		Rituximab	7.73±7.33	
Mental health composite score change (after-before)	4.98 ± 8.20	Natalizumab	5.78±8.59	0.848
		Interferon beta	4.43±8.16	
		Fingolimod	3.30±10.04	
		Rituximab	3.33±4.33	

∗ Within group comparison (changes between after and before versus type of treatment), Physical health composite: Kruskal Wallis test and Mental heal composite: One-way ANOVA. **SD.** Standard deviation.

Table 8. Changes in scores between before and after the pharmacist-led intervention (PI), and relation with duration of current treatment

QoL composites	Mean±SD	Duration of current treatment	Mean±SD	P*
Physical health composite score change (after-before)	8.54±9.50	= or < 1 year	8.65±8.64	0.351
		> 1 year	6.91±5.98	
Mental health composite score change(after-before)	4.98 ±8.20	= or < 1 year	5.75±8.41	0.530
		> 1 year	4.44±8.12	

∗ Within group comparison (changes between after and before versus duration of current treatment), Physical health composite: Mann-Whitney test and Mental heal composite: Independent t-test. SD. Standard deviation.

Discussion

In this study, the scales of PHC (health perception, energy, bodily pain, sexual function, and social function), MHC (overall QoL, emotional well-being, and cognitive function) and health distress scale in both composites have significantly improved after PI (pvalue<0.05), except the scale of physical function in PHC have non significantly affected by PI (pvalue>0.05), this result may be attributed to short period of intervention and MS patients are much less active than healthy individual.[31] One of the fundamental effects of both MS and aging is a reduction in lower extremity physical function, such as poor balance, slower walking speed, and decreased strength, all of which can lead to mobility handicaps or impairment of biological systems that cause disability.[32] Exercise training has emerged as an effective rehabilitation technique for controlling symptoms, regaining function, improving quality of life, promoting well-being, and increasing participation in activities of daily living.[33] Accordingly, the non-significant results on the physical function scale may be attributed to the fact that, while the researcher encouraged patients, particularly those with low physical function, to engage in some simple exercise training, only some patients responded due to their age, disability, lack of time, fatigue, and laziness.

Additionally, the change in health is a single item that is not significantly affected by PI (pvalue>0.05). The result also belongs to a short period of the study, and a noticeable change in health required a long period of follow-up, as in the study by Chruzander *et al.*[34] , which concluded that the effect of these changes in health in a long-term perspective (10 years) was small. Similar to the current study, other studies have shown no significant effect in shorter periods in 2 years[35] and 5 years[36] In general, the PHC and MHC of MSQoL have been significantly affected by PI (pvalue<0.05). Multiple sclerosis (MS) patients have a wide range of symptoms, including muscle stiffness and weakness, gait difficulties, chronic pain, exhaustion, sleep disturbances, and bowel and bladder dysfunction.[37] Kister *et al.*'s symptom prevalence study, based on data from the North American Research Committee on Multiple Sclerosis (NARCOMS), found that mobility (gait) impairment and severity of pain, spasticity, fatigue, and bowel and bladder dysfunction increased with disease duration.[38] Sleep disturbances may be caused by MS symptoms such as pain, stiffness, and voiding dysfunction, and they can also contribute to exhaustion.[39] This demonstrates MS's broad symptomatology, characterized by a complex interaction of physical,

cognitive, and mental symptoms. QoL is considerably reduced in Patients with MS and is tightly linked to depression, fatigue, and physical activity.[40] Zhang *et al.* discovered that fatigue, balance problems, sensory issues, and walking difficulties greatly influenced quality of life.[41] The majority of the MS-related symptoms have individually been associated with reduced QoL in previous research, including pain[42], spasticity [43]and fatigue[44]. In the current study, most of these symptoms were improved after intervention, as in numerous studies mentioned previously [15–18], by educating about how to deal with these symptoms non-pharmacological or telling the patients to visit the physicians and communicate with them to prescribe some additional drugs if not already prescribed. The findings of this study, such as the outcome of A recent investigation on the influence of clinical pharmacist intervention on another condition in Iraq, breast cancer women determined that the outcome was excellent. by Alkashaf et al.[27] 2024. Regardless of this, pharmacists in Iraq, during their studies in college, undergo hospital training and educate patients about treatment. A qualitative study at several hospitals in Baghdad, Iraq, in 2022 by Mohammed *et al*.(45) to recognize recent graduates' perceptions, benefits, and factors influencing the quality of hospital training courses for pharmacy students and resulted in the hospital training course effectively preparing the graduate pharmacist for future work in hospitals. Pharmacists in Iraq have a high orientation and desire to educate and counsel patients and join continuing pharmacy education programs. Mohammed *et al*.[46] 2019 did a cross-sectional study to assess the perceptions and tendencies of community pharmacists in Iraq regarding patient counseling and continuing pharmacists' educational programs in different governorates of Iraq. This study provided a clue that most community pharmacists in Iraq had an optimistic perception toward patient counseling and continuing pharmacy education programs. Nowadays, Pharmacy colleges in Iraq are moving towards studying PharmD and specializing in clinical pharmacy more. This helps move towards the clinical field to strengthen the clinical role of pharmacy in hospitals. The students' expectations were optimistic that the role of the clinical pharmacist in hospitals would become stronger. The qualitative study in 2023 by Hussain AH *et al.*[47] to assess the beliefs, attitudes, and obstacles of PharmD students at the College of Pharmacy, University of Baghdad, during their first year in the newly adopted PharmD program resulted in Despite some challenges during the first year of the program, most participants were hopeful about the future of PharmD in Iraq and believe that it will be. We can exploit this trend by including the educational programs that we applied in our study for pharmacists, and they may be a source for increasing the quality of life of patients. Our study's designed pamphlet was well-received by patients. In addition, neurologists who read the pamphlet stated that it would reduce their workload and increase patients' knowledge about their disease and treatment, leading to increased adherence. Similar to a study mentioned previously by Alkashaf et al.[27] 2024 also used educational pamphlets, and the oncologist in the study center also stated the same. This was an incentive for us to do the educational pamphlet. In addition to increased adherence, this has contributed to improving the quality of life of MS patients, as they can now know how to self-inject their treatment and how to deal with it at home. In addition, all non-pharmacological education about disease and treatment. In addition to that, we examine the changes in score between after and before with demographic data groups (age, sex, educational level, social status, treatment, and duration of current treatment); there are non-significant differences between demographic groups, all resulted in (pvalue>0.05), this is mean all patients received the educational advice in the same level. As a result, the findings of this study will assist policymakers, Ministry of Health planners, doctors, health care professionals, and others in developing effective plans and interventions to improve patients' quality of life.

Limitations

The study's main limitations were the small sample size, the short study period and the single-center study, although the selected center received patients from different governorates. The researcher encountered challenges in coordinating the meeting date with the patient due to varying protocols regarding the timing of treatment administration.

Conclusion

A clinical pharmacist-led educational intervention may enhance the quality of life of multiple sclerosis patients and play a crucial role in education of patients about disease-modifying therapy complications, adverse effects, and disease-related problems.

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None

Conflicts of Interest

Not present for all authors.

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Ethics Statements

Approval was obtained from the Scientific and Ethical Commit (approval number: RECAUBCP6112023A). Additionally, approval from the Ministry of Health was obtained. Patients' consent to participate in the current study was obtained verbally.

Author Contribution

The authors confirm contribution to the paper as follows: study conception and design: Author A and Author B; data collection: Author A; analysis and interpretation of results: Author A, Author B and Author C; draft manuscript preparation: Author A, Author B, and Author C. All authors reviewed the results and approved the final version of the manuscript.

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تأثير الاستشارة التي يقدمها الصيدلي السريري على جودة حياة المرضى على المدى القصير بين المرضى العراقيين المصابين بالتصلب المتعدد ويأخذون العلاج المعدل للمرض

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الخلاصة

التصلب المتعدد له تأثير كبير على نوعية حياة المرضى. للصيادلة تأثير كبير على علاج الأشخاص المصابين به وقد يلعبون دورا مهما في تحسين نوعية حياتهم . تهدف هذه الدراسة الى تقييم مدى فعالية التدخل الذي يقوده الصيدلي السريري على نوعية حياة المرضى. تم اجراء دراسة ما قبل وبعد تدخل الصيدلي السريري في العيادة الاستشارية العصبية في مدينة الطب ببغداد. تلقى كل مريض جلستين تعليميتين: الأولى عند خط الأساس بعد ملء النسخة العربية من استبيان جودة الحياة (MSQOL-29) والثانية بعد شهر. استغرقت كل جلسة حوالي ٣٠-٤٥ دقيقة، وتلقى المرضى استشارات تعليمية وتم إعداد كتيب باللغة العربية لكل مريض. ثم، بعد شهرين، تم إعادة ملء نفس الاستبيان. تم تسجيل ثمانون مريضا وأكمل خمسة وستون من هؤلاء المرضى الدراسة. كان متوسط عمر المشاركين ٣٠,٦٤ ±٨,٥٤. أدى تدخل الصيدلي السريري الى تحسين ملحوظ في مركبي الصحة البدنية والعقلية، لم يؤثر تدخل الصيدلي على الوظيفة الجسدية في مركب الصحة البدنية والتغيير في الصحة وايضا الفرق بين الدرجات قبل وبعد تدخل الصيدلي لم تكن مختلفة بين مجموعات المرضى. وفي النهاية، لخصت الدراسة الى أن التدخل التعليمي الذي يقوده الصيدلي السريري قد يعزز نوعية حياة مرضى التصلب المتعدد.الكلمات المفتاحية: كتابة على الاقل ٥ كلمات مفتاحية و تظهر حسب التسلسل المذكور للكلمات المفتاحية في اللغة الانكليزية.

الكلمات المفتاحية: العلاجات المعدلة للمرض، تصلب العصب المتعدد، تدخل الصيدلي السريري، الرعاية الصيدلانية، جودة الحياة.