ARTICLE

Use of Nicotine Replacement Therapy in Adolescent Smokers and Nonsmokers

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Background: Assessing whether and how adolescents use nicotine replacement therapy (NRT) will be important given recent recommendations to make NRT more accessible by lowering its price, increasing its distribution, and advising health care professionals to suggest its use for smoking cessation.

Objectives: To report the prevalence, ease of access, and reasons for NRT use and describe inappropriate use in adolescent smokers and nonsmokers.

Design: Cross-sectional survey of 4078 high school students during the school term of 1998.

Setting: City schools in Memphis, Tenn.

Main Outcome Measures: Community-based self-reported prevalence of NRT use and characteristics of those using NRT.

Results: Approximately 5% of adolescents reported trying or using nicotine gum or patches. Females were less likely than males and African Americans were less likely than others to use NRT. For African American smokers, NRT use was highest at lower smoking levels, while other smokers showed the opposite pattern. Almost 40% of former smokers reported using NRT to try to quit smoking; however, 75% of current smokers endorsed using NRT for reasons other than trying to quit smoking. Other inappropriate use of NRT was reported; 18% of NRT users reported themselves as never smokers. More than 50% of students reported that it would be easy for them to get NRT.

Conclusions: Nicotine replacement therapy is used by adolescent smokers and nonsmokers, is easily accessible, and is used for reasons other than trying to quit smoking. Efforts are needed to discourage NRT use in nonsmoking youth and to encourage appropriate use of NRT in young smokers to maximize its potential for successful cessation.

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DESPITE MEASURES to control tobacco use, rates of cigarette smoking in youth remain high. In 2000, the prevalence of cigarette smoking was 15.1% among middle school students and 34.5% among high school students.[1] More than half of these smokers reported wanting to stop and more than half had tried to quit in the preceding 12 months[1]; however, young smokers report nicotine dependence and have trouble quitting smoking.[2-4] Since young smokers appear nicotine dependent,[5-8] cessation methods, including nicotine replacement therapy (NRT), have been considered for youth.[9-11]

Increased NRT use by smokers, including adolescents, is anticipated as public health recommendations and policies increase its accessibility. These approaches include increasing access to NRT by expanding the type of sales outlets and reducing the restrictions on packaging,[12] reducing or eliminating the cost of cessation therapies,[13] and recommending that clinicians offer NRT for treating adolescent smokers when nicotine dependence and a desire to quit smoking are evident.[11]

While benefits of NRT accessibility to aid adolescent smokers are anticipated, health advocates recognize the need to balance this benefit against the risk of increased exposure of nonsmoking youth to NRT and the need for adolescent smokers to use NRT appropriately and efficiently to maximize its effectiveness for cessation. Currently, information about NRT exposure in adolescents or cessation methods used by adolescent smokers is sparse. Surveys to document NRT use in youth and to track appropriate and efficient use of NRT in adolescent smok-

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rently used NRT several times a week, and 63.9% had tried NRT at least once (reflecting any level of past use). Of current or past NRT users, 41.7% used gum exclusively, 29.2% used the patch exclusively, and 29.2% used both.

Overall, NRT use differed by sex and by race or ethnicity (Table 1). Males were significantly more likely than females (χ^2_3=58.7, P<.001) to report past use of NRT (4.9% vs 2.2%, respectively), NRT use several times a week (1.8% vs 0.5%), and current daily NRT use (1.6% vs 0.3%). African Americans were the least likely to have tried NRT compared with other race or ethnicity groups (χ^2_{12}=153.1, P<.001). Past NRT use was highest but regular current use lowest among whites. Current daily NRT use was highest among Hispanic and Asian youth.

NRT USE AND SMOKING STATUS

Unadjusted NRT prevalence varied significantly by smoking status (χ^2_{15}=326.8, P<.001) (Table 2). Past NRT use was most prevalent among current daily smokers, followed by former smokers, current infrequent smokers (<1 cigarette per week), light smokers (<1-6 cigarettes per week), experimental smokers, and never smokers. Regular current use of NRT was highest for infrequent smokers, followed by light smokers and daily smokers (≥1 cigarette per day). Less than 1% of never smokers and 4.6% of former smokers reported current NRT use.

Analyses identified independent associations among demographic and smoking variables with NRT use. Models indicated significant 2-way interactions (χ^2_1=8.65, P=.003) between sex and race or ethnicity (not shown). Specifically, NAA males were 1.82 times more likely to currently use NRT than AA males (95% confidence interval [CI], 1.3-2.6). Use of NRT was 4 times less likely among AA females than males (odds ratio [OR], 0.22; 95% CI, 0.15-0.38). Finally, NAA females were at similar risk to AA males in their likelihood of NRT use (OR, 1.2; 95% CI, 0.8-1.8).

Additional logistic regression models predicting NRT use by smoking status, race or ethnicity, and sex as well as potential interactions were analyzed. Significant 2-way interactions between smoking status and race or ethnicity and between smoking status and sex were found. As a result, 4 race-ethnicity × sex categories were separately analyzed (**Table 3**).

Among AA males, smoking increased the likelihood of NRT use as compared with never smokers. The effects ranged from a 14-fold increased likelihood for infrequent smokers (<1 cigarette per week) to a 3-fold increase for experimental smokers compared with never smokers. Former smokers (OR, 4.4; 95% CI, 2.2-9.8), current light smokers (OR, 6.6; 95% CI, 2.6-16.7), and daily smokers (OR, 5.4; 95% CI, 2.3-13.0) all had similar ORs of NRT use compared with never smokers. Among NAA males, NRT use was more likely for daily smokers (OR, 11.1; 95% CI, 4.4-27.5) and former smokers (OR, 5.3; 95% CI, 1.8-15.1) than never smokers.

Among AA females, infrequent smokers (OR, 13.4; 95% CI, 4.3-41.5), light smokers (OR, 11.7; 95% CI, 1.4-100.4), and former smokers (OR, 10.9; 95% CI, 3.3-36.8) showed similar ORs of NRT use compared with never smokers. Experimental smokers (OR, 2.7; 95% CI, 1.1-6.5) were significantly more likely to use NRT than never smokers. Although not significant, heavy smokers were more likely than never smokers to use NRT (OR, 4.0; 95% CI, 0.5-32.7). Among NAA females, NRT use was more likely in daily smokers (OR, 20.8; 95% CI, 4.7-91.2), current light smokers (OR, 8.4; 95% CI, 1.1-63.3), and former smokers (OR, 21.6; 95% CI, 4.5-102.9) than never smokers.

Table 1. Frequency of NRT Use by Characteristics of Adolescents in Memphis, Tenn, 1998

		NRT Use, %			
	No. of Subjects*	Never Tried	Tried at Least Once	Use Several Times a Week	Use Every Day
All youth	4078	94.7	3.4	1.0	0.9
Sex					
Male	1695	91.7	4.9	1.8	1.6
Female	2344	97.0	2.2	0.5	0.3
Race/ethnicity					
White	655	90.7	8.8	0.2	0.3
African American	3123	96.2	1.9	1.2	0.7
Asian	71	88.7	1.4	5.6	4.2
Hispanic	30	90.0	3.3	0.0	6.7
Other	108	85.2	10.2	0.9	3.7

Abbreviation: NRT, nicotine replacement therapy (gum or patch).
*Because of missing data, numbers do not total 4078.

Table 2. Frequency of NRT Use by Smoking Status of Adolescents in Memphis, Tenn, 1998

		NRT Use, %			
Smoking Status	No. of Subjects	Never Tried	Tried at Least Once	Use Several Times a Week	Use Every Day
Never smoker	2239	98.3	1.0	0.5	0.3
Former smoker	242	85.5	9.9	2.5	2.1
Experimental smoker	1061	95.6	3.0	0.9	0.5
Smoker					
<1 Cigarette/wk	166	83.1	7.2	4.8	4.8
1-6 Cigarettes/wk	112	86.6	5.4	4.5	3.6
≥1 Cigarette/d	258	79.8	16.3	1.6	2.3

Abbreviation: NRT, nicotine replacement therapy (gum or patch).

REASONS FOR USING NRT

Among former and current smokers who previously tried or were currently using NRT, reasons for use were queried (**Table 4**). Former smokers most frequently reported using NRT to try to quit smoking. Use of NRT when unable to smoke was reported most frequently by daily smokers and those smoking 1 to 6 cigarettes per week. Finally, almost 30% of current and former smokers reported simultaneous use of NRT and smoking. This ranged from 44.4% of infrequent smokers (<1 cigarette per week) to 15.4% of those smoking 1 to 6 cigarettes per week.

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Table 3. Odds Ratios (ORs) and 95% Confidence Intervals (CIs) for Associations Between Smoking Status and Nicotine Gum or Patch Use by Race/Ethnicity and Sex Among Adolescents in Memphis, Tenn, 1998*

	Males		Females	
	African American (n = 1256)	Others (n = 410)	African American (n = 1857)	Others (n = 452)
Never smoker	Referent	Referent	Referent	Referent
Former smoker	4.4 (2.2-9.8)	5.3 (1.8-15.1)	10.9 (3.3-36.8)	21.6 (4.5-102.9)
Experimental smoker	3.2 (1.7-5.8)	1.2 (0.4-3.9)	2.7 (1.1-6.5)	2.5 (0.4-15.2)
Smoker				
<1 Cigarette/wk	14.3 (7.0-28.9)	3.2 (0.8-13.3)	13.4 (4.3-41.5)	3.2 (0.3-36.6)
1-6 Cigarettes/wk	6.6 (2.6-16.7)	2.6 (0.6-10.9)	11.7 (1.4-100.4)	8.4 (1.1-63.3)
≥1 Cigarette/d	5.4 (2.3-13.0)	11.1 (4.4-27.5)	4.0 (0.5-32.7)	20.8 (4.7-91.2)

*Data are given as OR (95% CI).

Table 4. Characteristics of NRT Use Among Smokers Reporting Any Use of NRT, Adolescents in Memphis, Tenn, 1998

		Reason for NRT Use, %*		
	No. of Subjects	To Try to Quit Smoking	When Unable to Smoke	Used NRT and Smoked,† %
All subjects	**170**	28.2	22.4	29.4
Former smoker	33	39.4	24.2	30.3
Experimental smoker	45	22.2	13.3	24.4
Smoker				
<1 Cigarette/wk	27	29.6	11.1	44.4
1-6 Cigarettes/wk	13	23.1	30.8	15.4
≥1 Cigarette/d	52	26.9	32.7	29.4

Abbreviation: NRT, nicotine replacement therapy (gum or patch).
*Categories are mutually exclusive.
†This question, asked independently of "reasons for using NRT," was "Have you ever used nicotine products (gum or patches) and smoked at the same time?"

EASE OF OBTAINING NRT AND SOURCES OF ACCESS

About half (55.5%) of the entire sample reported that "it is or would be easy" for them to get NRT products. Among the 216 students with previous or current NRT use, multiple sources of access were reported. Most frequent, at 31.5%, was having bought NRT products in a store; others, not mutually exclusive, were as follows: 25.5% had gotten them from a friend, 8.8% had gotten them from a sibling, 19.0% had gotten them from parents, 9.3% had obtained them from a nonparental adult, and 12.0% had taken NRT without adults knowing. In addition, 11.6% reported that a physician had arranged for them to get NRT.

COMMENT

This study describes the prevalence of NRT use, characteristics of NRT users, reasons for NRT use, and accessibility of NRT products to adolescents among a large sample of urban high school youth. A nontrivial prevalence of NRT use was measured, with 5% of all students reporting previous or current use of nicotine gum or patches. Furthermore, about 27% of current smokers and 39% of former smokers reported having tried or used NRT, which supports self-reports of many young smokers that they want to quit.[2]

Demographic differences in the prevalence of NRT use were documented. Notable was that NRT use among AA youth was significantly lower than among other race or ethnicity groups. Lower NRT use among AA youth may reflect the lower prevalence of cigarette smoking among AA compared with white youth[2,17] or fewer attempts to quit smoking. However, for AA smokers in this study, those smoking fewer cigarettes (<1 cigarette per week) were more likely than frequent smokers to use NRT. Since the youth cessation literature is primarily reported for nonminorities, little information is available to compare this finding.

USE OF NRT AMONG SMOKING GROUPS

In this sample, smoking at any level was related to an increased likelihood of past or current NRT use compared with nonsmokers. Although the data are based on small cell sizes, among AA males and females the likelihood of NRT use was greatest in infrequent smokers (<1 cigarette per week). In contrast, for NAA youth, NRT use was most frequent at higher smoking levels (ie, at least 1 cigarette daily) compared with never smokers. These results may reflect the underlying prevalence of intentions and attempts to quit smoking in the respective race-sex groups. For example, in adolescent smokers aged 12 to 18 years, definite intentions to quit smoking in the future were most common in occasional smokers (ie, <1 cigarette per day within the past 30 days).[3] Recently, reports suggest that among AA adult smokers, those at lighter levels of smoking were more likely to be in preparatory stages of quitting compared with moderate or heavy smokers.[18] To the extent that these findings in AA adults are mirrored in youth, increased NRT use in light smokers may be related to a greater likelihood of intentions to quit in our study. Limited support for this hypothesis is available from a study evaluating teen smokers applying to a cessation trial. Compared with NAA,

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AA youth had similar motivation to quit; however, they had lower nicotine dependence scores and smoked fewer cigarettes on the weekend.[19]

About 40% of former smokers and one fourth of current smokers reported NRT use to try to quit smoking. While we were unable to determine whether NRT use resulted in successful cessation among former smokers, because of the cross-sectional nature of our data, the results are intriguing. Similarly, NRT use among current smokers may indicate current attempts at cessation or, at the very least, intentions to try to quit. These findings are supported by national statistics that many young smokers report wanting to quit and that cessation attempts are common.[1,2] Limited literature is available on cessation methods preferred by young smokers. A recent Canadian study reported that a majority of adolescent smokers preferred quit contracts with their friends and stated only a 4.9% preference for NRT.[20] These preference rates are lower than the actual NRT rates reported in our study. Studying young smokers to compare the type, preference, and frequency of use of various cessation methods, including NRT, will provide a means to compare these findings.

INAPPROPRIATE USE OF NRT

Experimentation with NRT or use by never smokers is a potential harm of increased availability of these products. Our study indicated that among past or current NRT users, 18% were never smokers. While the addictive properties of NRT appear low,[21] NRT use in nonsmoking youth raises concern. Information on concurrent use of NRT and other illicit substances in youth is not currently available, nor are studies investigating NRT as a gateway substance. Such information would be valuable in forming an appropriate response to potential experimental NRT use in youth.

Results indicated that more than three quarters of smokers failed to endorse their NRT use as being related to trying to quit smoking. If NRT use is considered appropriate only for smoking cessation efforts, we conclude that most young smokers may use NRT inappropriately. In addition, more than 30% of NRT users smoking 1 or more cigarettes per week reported using NRT in situations where they were unable to smoke. Benefits of NRT use among infrequent and experimental smokers are not documented, so its use in smoking cessation or as a prevention method to thwart progression to heavier smoking remains uncertain.[10]

Simultaneous use of NRT and cigarettes was reported in this survey of adolescents. For adolescents smoking less than 1 cigarette per week, more than 40% reported using NRT in this manner. This combined use of NRT and cigarettes appears abusive, but it may reflect failed attempts or preliminary steps to quit smoking. Although label recommendations for nicotine gum and patches include directions to not smoke while using the product, a recent review of pharmacotherapies for smoking cessation in adults suggests that sufficient evidence exists to consider the relative safety of combined use of cigarettes and NRT.[22] However, since data on the physiological effects and biological consequences of combined exposures of cigarettes and NRT in youth are currently unavailable, clear recommendations for young smokers cannot be offered.

While promoting use of NRT in young smokers may lead to beneficial cessation outcomes, it appears that an appreciable concern for inappropriate use of NRT is warranted. Educational efforts to promote appropriate use of NRT at the point of sale, in community settings, and in school-based programs should be explored to minimize inappropriate use and potential harm, while maximizing the effectiveness of NRT use to aid nicotine-dependent smokers in cessation.

YOUTH ACCESS TO NRT

Given that NRT is currently available over the counter and widely used by adults, youth may have ready access to NRT. More than half of the students surveyed reported that it is or would be easy to get NRT. Of those using NRT, the product was most frequently obtained by purchasing it in a store. While product labeling of NRT recommends that it not be sold to anyone younger than 18 years,[14] it appears from our survey that NRT is easily obtained by adolescents. These data support findings from our research group that NRT is readily purchasable by minors without proof of age, although this may be attributable to regional norms (L.M.K., K.C.J., G.W.S., and M. C. Coday, PhD, unpublished data, 2000).

Among NRT users, almost 12% reported that a physician arranged for them to get NRT. These data, collected in 1998, predate the June 2000 release of the new clinical practice guidelines recommending that physicians counsel nicotine-dependent adolescents to consider NRT use to aid in cessation efforts. It appears from our survey that the guidelines are promoting what many practitioners may already be practicing, ie, recommending NRT to adolescent smokers.

EXPANDING THE EVIDENCE BASE

Potential limitations of this study include its cross-sectional design. To clearly judge the effectiveness of NRT in smoking cessation in youth, prospective studies are needed to establish the time course of cessation attempts and NRT use. Representativeness of the current sample is restricted in that it reflects a regional, urban, socially disadvantaged, public school sample of high school students. Replication in young adult samples in other geographic regions and socioeconomic groups is needed to expand the generalizability of these findings. Surveillance of NRT use in national data programs, such as Monitoring the Future and the Youth Behavioral Risk Factor Surveys, should be considered.

Although many current and former smokers report using NRT to quit smoking, misuse was reported by never smokers, and some youth reported using NRT simultaneously with smoking cigarettes. Potential misuse coupled with easy NRT accessibility leads us to recommend youth monitoring and education programs to enhance appropriate use of NRT. In particular, health care guidelines and professional training may be needed to establish counseling programs to discourage inappropriate use of NRT and enhance the effectiveness of its use as a cessation aid in

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What This Study Adds

To reduce tobacco use in youth and adults, recommendations to increase NRT accessibility are being instituted to aid cessation. Information is unavailable on the extent to which NRT is used in nonsmoking youth and whether adolescent smokers use NRT efficiently. This study reports survey results on NRT use and smoking status in high school students in Memphis, Tenn. We found that approximately 5% of all respondents reported using nicotine gum or patches. While both current and former smokers reported use of NRT to quit smoking, NRT use also was reported by never smokers. Unapproved use of NRT was seen, with almost three quarters of current smokers endorsing use of NRT for reasons other than trying to quit smoking, and some youth reported simultaneous use of NRT while smoking cigarettes. While public health benefits of increased accessibility of NRT are anticipated, they will be maximized if community and school interventions can reduce inappropriate use of NRT in nonsmokers and assist adolescent smokers to use NRT efficiently to improve the likelihood of successful cessation.

young smokers. These actions are especially important to consider as clinical guidelines are now recommending NRT use in nicotine-dependent adolescent smokers.

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