Smoking Tied to Greater Type 2 Diabetes Risk

BY MARY ANN MOON Contributing Writer

igarette smoking is associated with an increased risk of developing type 2 diabetes, results of a metaanalysis suggest.

"Active smokers had an increased risk of developing type 2 diabetes, compared with nonsmokers, with a pooled relative risk of 1.44," study investigators reported.

The researchers conducted a meta-

analysis of all 25 prospective cohort studies of the issue in the United States, Europe, Japan, and Israel that were published between 1992 and 2006.

All of the studies examined a possible link between smoking and irregularities of glucose metabolism, and all but one found a positive association, Dr. Carole Willi of the University of Lausanne (Switzerland) and her associates wrote. The number of study subjects ranged

from 630 people to more than 700,000

people, for a total of 1.2 million subjects and 45.844 cases of incident diabetes in the meta-analysis. Overall, 35% of the people were current smokers. Follow-up ranged from 5 to 30 years.

The association between smoking and diabetes remained robust through numerous statistical analyses that explored study factors as well as clinical variables. The findings also suggested a dose-response relationship, because the association with diabetes was stronger among heavy smokers than among light smokers, and was stronger in active smokers than in former smokers.

'Given this consistency, we conclude that the relevant question should no longer be whether this association exists, but rather whether this established association is causal," Dr. Willi and her associates said (JAMA 2007;298:2654-64).

There is theoretical biological plausibility for causality in that smoking may lead to insulin resistance or inadequate

LYRICA® (PREGABALIN) CAPSULES BRIEF SUMMARY: For full prescribing information, see package insert INDICATIONS AND USAGE

- UVDICATIONS AND Sector
 LYRICA is indicated for:
 Management of neuropathic pain associated with diabetic peripheral neuropathy
 Management of postherpetic neuralgia
 Adjunctive therapy for adult patients with partial onset seizures
 Management of fibromyalgia

LYRICA is contraindicated in patients with known hypersensitivity to pregabalin or any of its components.

a) Alagament of Horomyalgia:
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events reported as rhabdomyolysis in premarketing clinical trials. The relationship between these myopathy events and LYRICA is not completely understood because the cases had documented factors that may have caused or contributed to these events. Preschers should instruct patients to promptly report unexplained muscle pain, tenderness, or weakness, particularly if these muscle symptoms are accompanied by malaise or fever. LYRICA treatment should be discontinued if myopathy is diagnosed or suspected or if markedly elevated creatine kinase levels occur. **Decreased Platelet Count** LYRICA treatment should be discontinued if myopathy is diagnosed or suspected or if markedly elevated creatine kinase levels occur. **Decreased Platelet Count** LYRICA treatment should be discontinued if myopathy is diagnosed or suspected or if markedly elevated creatine kinase levels occur. **Decreased Platelet Count** LYRICA treatent subject sexperienced a mean maximal decrease in platelet 20 x 10¹/µL. Decreased of controlled trials, 2% of placebo patients in 10¹/µL. A single LYRICA treated subject developed severe thrombocytopenia with a platelet count less than 20 x 10¹/µL. In randomized controlled trials, LYRICA treatend was associated with an increase in bleeding-related adverse sections. **PR Interval Prolongation**. In analyses of clinical trial ECG data, the mean PR interval increase was 3–6 msec at LYRICA treates >200 mg/dx). This mean change difference was not associated with an increase >300 mg/dx). This mean change difference was not associated with an increase >200 mg/dx). This mean change difference was not associated with an increase of second or third degree AV block. Subgroup analyses did not identify an increased risk of PR prolongation in the platents with asking others PR prolongation or in patients taking other PR prolonging medications. However, these analyses cond the chindred definitive because of the limited number of patients in these categories. **ADVERSE REACTIONS** ADVERSE REACTIONS

AUVERSE NEACTIONS Clinical Trials Experience Because clinical trials or a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in practice. In all controlled and uncontrolled trials of another drug and may not reflect the rates observed in practice. In all controlled trials the clinical trials of another drug and may not reflect the rates observed in practice. In all controlled trials another discover the trial of the trial als Experience Because clinical trials are conducted under widely varving Discontinuation In clinical trials in patients with neuropathic pain associated with diabetic peripheral neuropathy, 9% of patients treated with LYRICA and 4% of patients treated with placebo discontinued prematurely due to adverse reactions. In the LYRICA treatment group, the most common reasons for discontinuation due to adverse reactions were diziness (3%) and sonnolence (2%). In comparison, 1% of placebo patients withdrew due to diziness and somnolence. Other reasons for discontinuation from the trials, occurring with greater frequency in the LYRICA group than in the placebo group, were asthenia, confusion, and peripheral edema. Each of these events led to withdrawal in approximately 1% of platents. *Most Common Adverse Reactions* Table 1 lists all adverse reactions, regardless of causality, occurring in ≥1% of patients with neuropathic pain associated with diabetic neuropathy in the placebo group. A majority of pregabalin-treated patients in clinical studies had adverse reactions with a maximum intensity of "mild" or "moderate".

Table 1 Treatment-emergent adverse reaction incidence in controlled trials in Neuropathic Pain Associated with Diabetic Peripheral Neuropathy (Events in at least 1% of all LYRICA-treated patients and at least numerically more in all LYRICA than in the placebo group)

Body System - Preferred term	75 mg/d [N=77] %	150 mg/d [N=212] %	300 mg/d [N=321] %	600 mg/d [N=369] %	All PGB* [N=979] %	Placebo [N=459] %
Body as a whole	-					
Asthenia	4	2	4	7	5	2
Accidental injury	5	2	2	6		3
Back pain	Ő	2	ī	2	4 2	ŏ
Chest pain	4	1	1	2	2	1
Face edema	ñ	1	1	2 2 2	1	ó
Digestive system	0			2		0
Dry mouth	3	2	5	7	5	1
Constipation	Ő	2	4	6	4	2
Flatulence	3	õ	2	3	2	1
Metabolic and		0	L	5	2	
nutritional disorde	ers					
Peripheral edema	4	6	9	12	9	2
Weight gain	Ó	4	4	6	4	õ
Edema	ñ	2	4	2		Ō
Hypoglycemia	1	3	2	ī	2	1
Nervous system						
Dizziness	8	9	23	29	21	5
Somnolence	4	6	13	16	12	3
Neuropathy	9	2	2	5	4	3
Ataxia	6	ī	2	4	3	1
Vertigo	1	2	2	4	3 2 2 2	1
Confusion	ċ	ī	2	3	2	1
Euphoria	Ō	Ó	3	2	2	Ó
Incoordination	1	ō	2	2	2	ō
Thinking abnormal	' 1	0	1	2 2 3 2 3	2	0
Tremor	1	1	1	2	1	ō
Abnormal gait	1	Ó	1	3	1	ō
Amnesia	3	1	0	2	1	0
Nervousness	Ō	1	1	1	1	ō
Respiratory system	n					
Dyspnea	3	0	2	2	2	1
Special senses						
Blurry vision ^a	3	1	3	6	4	2
Abnormal vision	1	Ó	1	ĭ	1	õ

compensatory insulin secretion responses according to several but not all studies," they wrote.

They noted that "Smoking also has a clinical significant effect on both oral and intravenous glucose tolerance tests that could influence diabetes detection.'

The adverse effect of smoking on diabetes risk "has been generally underrecognized," Dr. Eric L. Ding and Dr. Frank B. Hu of the Harvard School of Public Health, Boston, said in an editorial accompanying the report.

Dr. Ding and Dr. Hu estimated

that 12% of all type 2 diabetes in the United States may be attributable to smoking, based on this study's estimates, statistics on smoking prevalence, and an accepted population-attributable risk formula (JAMA 2007;298:2675-6). In addition, "an estimated 2.3

million cases of diabetes in the United States and a corresponding \$14.9 billion of the annual U.S. \$132 billion diabetes cost burden may be attributable to smoking," they said.

Although the exact mechanism by which smoking may contribute to the development of diabetes hasn't been identified, smoking is known to be related to central adiposity, to increase inflammation and oxidative stress, to directly damage beta-cell function, to impair endothelial function, and to impair insulin sensitivity and glucose tolerance, Dr. Ding and Dr. Hu said.

Given the findings of Dr. Willi and her associates, it is "important and prudent for clinicians to screen for and carefully monitor glucose levels among current and former smokers," they added.



Active smokers had a pooled relative risk of 1.44 for developing type 2 diabetes compared with nonsmokers.

¹Investigator term; summary level term is antibyopia.
<u>Controlled Studies in Postherpetic Neuralgia</u> Adverse Reactions Leading to Discontinuation In clinical trials in patients with postherpetic neuralgia. 14% of patients treated with LYRICA and 7% of patients treated with JPRICA and 7% of patients treated with LYRICA server discusses (4%) and somolence (3%). In comparison, less than 1% of placebo group, batents withdrew due to diziness and somolence. Other reasons for discontinuation for the trials, occurring in greater frequency in the LYRICA group than in the placebo group, user conclusion [2%), as well as peripheral edema, asthenia, ataxia, and abnormal gait [1% each]. Most Common Adverse Reactions, Table 2, lists all adverse reactions. In the line of the patients with neuropathic pain associated with postherpetic neuralgia in the combined LYRICA group than in the placebo group. In addition, an event is included, even if the incidence in the all LYRICA group is not greater than in the placebo group. If the incidence of the event in the 600 mg/day group is more than twice that in the placebo group. A majority of pregabalin-treated patients in clinical studies had adverse reactions with a maximum intensity of mild or moderate². Table 2 Treatment-emergent adverse event incidence in controlled trials in Neuropathic Pain Associated with Postherpetic Neuralgia (Events in at least 1% of all LYRICA-treated patients and at least numerically more in all pregabalin than in the placebo group) All PGB* [N=852] 75 mg/d 150 mg/d 300 mg/d 600 mg/d [N=84] [N=302] [N=312] [N=154] Placebo [N=398]

Thinking abnormal primarily consists of events related to difficulty with concentration/attention but also includes events related to cognition and language problems and slowed thinking. Investigator term; summary level term is amblyopia.

- Preferred term	[14=04] %	[14=302] %	[IN=312] %	[14=134] %	[Iu=032] %	[N=350] %	
Body as a whole							_
Infection	14	8	6	3	7	4	
Headache	5	9	5	8	7	5	
Pain	5	4	5	5	5	4	
Accidental injury	4	3	3	5	3	2	
Flu syndrome	1	2	2	1	2	1	
Face edema	0	2	1	3	2	1	
Digestive system							
Dry mouth	7	7	6	15	8	3	
Constipation	4	5		5	5	2	
Flatulence	2	1	5 2 3	3	2	1	
Vomiting	1	1	3	3	2	1	
Metabolic and							
nutritional disorde	rs						
Peripheral edema	0	8	16	16	12	4	
Weight gain	1	2	5	7	4	0	
Edema	0	1	2	6	2	1	
Musculoskeletal							
system							
Myasthenia	1	1	1	1	1	0	
Nervous system							
Dizziness	11	18	31	37	26	9	
Somnolence	8	12	18	25	16	5	
Ataxia	1	2	5	9	5	1	
Abnormal gait	0	2	4	8	4	1	
Confusion	1	2 2 2	3	7	3 2	0	
Thinking abnormal*	0	2	1	6	2	2	
Incoordination	2	2	1	3	2	0	
Amnesia	0	1	1	4	2	0	
Speech disorder	0	0	1	3	1	0	
Respiratory system							
Bronchitis	0	1	1	3	1	1	
Special senses							
Blurry vision [*]	1	5	5	9	5	3	
Diplopia	0	2	2	4	2	0	
Abnormal vision	0	1	2	5	2	0	
Eye disorder	0	1	1	2	1	0	
Urogenital system							
Urinary							
incontinence	0	1	1	2	1	0	
* PGB: pregabalin							

Prob. pregadualin 'Thinking abnormal primarily consists of events related to difficulty with concentration/attention but also includes events related to cognition and language problems and slowed thinking. I nvestigator term; summary level term is amblyopia.

Industry terms summary level term is amblyopia. Controlled Add-On Studies in Adjunctive Therapy for Adult Patients with Partial Onset Seizures Adverse Reactions Leading to Discontinuation Approximately 15% of patients receiving LYRICA and 6% of patients receiving placebo in add-on epilepsy trials discontinued prematurely due to adverse reactions. In the LYRICA treatment group, the adverse reactions most frequently leading to discontinuation were dizziness (6%), datai 4(%), and sonnolence (3%). In comparison, <1% of patients in the placebo group withdrew due to each of these events. Other adverse reactions at 1% of patients in the LYRICA and terms in the LYRICA group and at least twice as frequently compared to the placebo group were asthenia, diplopia, blurred vision, thinking abnormal, nausea, tremor, vertigo, headache, and confusion (which each led to withdrawal in 2% or less of patients). *Most Common Adverse Reactions* Table 31 tiss all dose-related adverse reactions core the adverse event in the 600 mg/day group was at least 2% grater than the rate in both the placebo and 150 mg/day groups. In these studies, 758 patients received LYRICA and 294 patients received placebo for up to 12 weeks. Because patients were also treated with 1 to 3 other AEDs, it is not possible to determine whether the following adverse reactions can be ascribed to LYRICA alone, or the combination of LYRICA and other AEDs. A majority of pregabalin-treated patients in clinical studies had adverse reactions with a maximum intensity of "mid" or "moderate". **Table 3 Dose-related measerements** of the INT of moderate".

Table 3 Dos-related treatment-emergent adverse reaction incidence in controlled trials in adjunctive therapy for adult patients with partial onset seizures (Events in at least 2% of all LYRICA-treated patients and the adverse reaction in the 600 mg/day group was \geq 2% the rate in both the placebo and 150 mg/day groups)

Body System - Preferred term	150 mg/d [N=185] %	300 mg/d [N=90] %	600 mg/d [N=395] %	All PGB* [N=670]⁺ %	Placebo [N=294] %
Body as a whole	7	44	10	0	
Accidental injury Pain	3	2	10 5	9 4	5

Digestive system					
Increased appetite	2	3	6	5	1
Dry mouth	1	2	6	4	1
Constipation	1	1	7	4	2
Metabolic and					
nutritional disorders					
Weight gain	5	7	16	12	1
Peripheral edema	3	3	6	5	2
Nervous system					
Dizziness	18	31	38	32	11
Somnolence	11	18	28	22	11
Ataxia	6	10	20	15	4
Tremor	3	7	11	8	4
Thinking abnormal*	4	8	9	8	2
Amnesia	3	2	6	5	2
Speech disorder	1	2	7	5	1
Incoordination	1	3	6	4	1
Abnormal gait	1	3	5	4	0
Twitching	0	4	5	4	1
Confusion	1	2	5	4	2
Myoclonus	1	0	4	2	0
Special senses					
Blurred vision ^s	5	8	12	10	4
Diplopia	5	7	12	9	4
Abnormal vision	3	1	5	4	1

PGB: pregabalin Excludes patients who received the 50 mg dose in Study E1 (included in full prescribing information). Thinking above mal primarily consists of events related to difficulty with concentration/attention but also includes events related to cognition and language problems and slowed thinking. Investigator term, summary level term is amblyopia. Investigator term, summary level term is amblyopia.

⁴ Investigator term; summary level term is amblyopia. <u>Controlled Studies with Fibromyalgia</u> Adverse Reactions Leading to Discontinuation In clinical trials of patients with fibromyalgia, 19% of patients treated with pregabalin (150–600 mg/day) and 10% of patients with fibromyalgia, 19% of patients using the pregabalin streated with pregabalin streated with placebo discontinuation due to adverse reactions. In the pregabalin treatment group, the most common reasons for discontinuation due to adverse reactions were diziness (6%) and somolence (3%). In comparison, <1% of placebo-treated patients withdrew due to diziness and somolence. Other reasons for discontinuation from the trials, occurring with greater frequency in the pregabalin treatment group than in the placebo treatment group, were faigue, headache, balance disorder, and weight increased. Each of these adverse reactions led to withdrawal in approximately 1% of patients. *Most Common Adverse Reactions* Table 4 lists all adverse reactions, regardless of causality, occurring in ≥2% of patients with fibromyalgia in the 'all pregabalin' treatment group. A majority of 'mild' or 'moderate'. **Table 4 Treatment-emergent adverse reaction incidence in controlled trials in Fibromyalgia**

Table 4 Treatment-emergent adverse reaction incidence in controlled trials in Fibromyalgia (Events in at least 2% of all LYRICA-treated patients and occurring more frequently in the all pregabalin-group than in the placebo treatment group)

System Organ Class - Preferred term	150 mg/d [N=132] %	300 mg/d [N=502] %	450 mg/d [N=505] %	600 mg/d [N=378] %	All PGB* [N=1517] %	Placebo [N=505] %	
	75	/-	70	70	70	70	
Ear and Labyrint	h Disorde 2	e rs 2	2	1	2	0	
Vertigo Eye Disorders	2	Z	2	1	Z	U	
Vision blurred	8	7	7	12	8	1	
Gastrointestinal			/	12	U	1	
Dry mouth	7	6	9	9	8	2	
Constipation	4	4	7	10	7	2	
Vomiting	2	3	3	2	3	2	
Flatulence	1	ĭ	2	2	2	1	
Abdominal disten	sion 2	2	2	2	2	1	
General Disorde					-		
Fatique	5	7	6	8	7	4	
Edema peripheral		5	6	9	6	2	
Chest pain	2	1	1	2	2	1	
Feeling abnormal		3	2	2	2	Ó	
Edema	1	2	1	2	2	1	
Feeling drunk	1	2	1	2	2	Ó	
Infections and In	festation	s					
Sinusitis	4	5	7	5	5	4	
Investigations							
Weight increased	1 8	10	10	14	11	2	
Metabolism and	Nutrition	Disorders					
Increased appetit	te 4	3	5	7	5	1	
Fluid retention	2	3	3	2	2	1	
Musculoskeletal	l and Con	nective Tissi	ue Disorders	;			
Arthralgia	4	3	3	6	4	2	
Muscle spasms	2	4	4	4	4	2	
Back pain	2	3	4	3	3	3	
Nervous System	Disorder	s					
Dizziness	23	31	43	45	38	9	
Somnolence	13	18	22	22	20	4	
Headache	11	12	14	10	12	12	
Disturbance in	4	4	6	6	5	1	
attention							
Balance disorder	2	3	6	9	5	0	
Memory impairm	ent 1	3	4	4	3	0	
Coordination abnor	rmal 2	1	2	2	2	1	
Hypoaesthesia	2	2	3	2	2	1	
Lethargy	2	2	1	2	2	0	
Tremor	0	1	3	2	2	0	
Psychiatric Diso	rders						
Euphoric Mood	2	5	6	7	6	1	
Confusional state		2	3	4	3	Ó	
Anxiety	2	2	2	2	2	1	
Disorientation	1	ō	2	1	2	Ó	
		-	-		-	-	