

# FURTHER STUDIES ON THE PREVALENCE OF ISOLATED SLEEP PARALYSIS IN BLACK SUBJECTS

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**In a previous study, one of the authors (C.C.B.) found isolated sleep paralysis was common in blacks. In this study, conducted by interviews, a recurrent pattern (one or more episodes per month) of isolated sleep paralysis episodes in blacks was described by at least 25 percent of the afflicted sample studied. Frequent episodes were associated with stress, and subjects with isolated sleep paralysis had an unusually high prevalence of panic disorder (15.5 percent). The genetic transmission of sleep paralysis was studied in a large black family, and in addition to stressful environmental factors being associated with the condition, there appears to be a dominant genetic factor associated with the predisposition for developing sleep paralysis. The implications of these findings for stress, anxiety, sleep, and psychophysiological disorders are discussed.**

In a previous paper, Bell et al<sup>1</sup> reported the findings from their first survey measuring the prevalence of isolated sleep paralysis in a black population of healthy subjects and psychiatric patients. The authors defined sleep paralysis as a state of consciousness<sup>2</sup> occurring while falling asleep or upon awakening, lasting for several minutes or a few seconds, and characterized by a feeling of an inability to move. While experiencing this state the individual is fully aware of the condition, surroundings, and has complete recall of the episode. Vivid and terrifying hallucinations often accompany this state of consciousness and a sense of acute danger may be felt. Once the episode of paralysis passes, the individual often sits up with a start, experiences symptoms of panic (eg, tachycardia, hyperventilation, fear) and realizes that the perceptions of danger were false.

In reviewing the existing literature on sleep paralysis, some interesting patterns emerge. With regard to the prevalence of isolated sleep paralysis, Bell et al<sup>1</sup> found that 41 percent of the total sample (N = 108) had experienced the state. Goode<sup>3</sup> and Everett<sup>4</sup> studied white populations and determined isolated sleep paralysis rates of 4.7 percent and 15.4 percent, respectively. Hufford<sup>5</sup> has reported on the results of his work, which spans more than a decade. His original isolated sleep paralysis work began with a study of the college student population in Newfoundland. He surveyed 93 students and found that 23 percent had experienced sleep paralysis, known as the "Old Hag" in Newfoundland. Hufford's research

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led him to assert that the phenomenon is found in a variety of cultural settings. He documents this with case histories of Eskimos and Filipinos who have experienced the state. Further he estimates that in the general population 15 percent or more have had at least one recognizable episode of isolated sleep paralysis.

Another significant contribution made by Huford is his description of the pattern of recurrence of isolated sleep paralysis episodes:

The recurrence of the event repeatedly during a single night is uncommon but not unique. Most frequently there is a single attack, either never repeated or repeated infrequently at intervals of months, or more often, years. In other cases a series of attacks may occur frequently, even nightly, for a period of a week or two. Multiple attacks during a single night are most likely during one of these runs. A victim may experience one such run and no more, or a number of these sequences may recur separated by months or years. Least common is the individual who experiences the attacks frequently over a period of years.<sup>5</sup>

However, Bell et al<sup>1</sup> found that a pattern of frequent episodes over a period of years is not uncommon among the black population they studied. Specifically, 27.3 percent of the subjects reported experiencing isolated sleep paralysis once or more monthly.

Thus, it would seem that the findings from the Bell et al<sup>1</sup> previous study of isolated sleep paralysis in black subjects are unique. The prevalence of isolated sleep paralysis in blacks seems higher than in other populations studied, and the pattern of recurrence of isolated sleep paralysis episodes that is least common in whites (ie, the individual who experiences the episodes frequently over a period of years) is prevalent in blacks.

These discrepancies led the authors to further investigate the nature of isolated sleep paralysis in the black population. Of particular interest from the previous paper was the indication of a possible correlation between sleep paralysis and stress. Isolated sleep paralysis was found in 50 percent of the precare subjects (anxious patients). Other supporting indications of a connection between stress and sleep paralysis are found in the closeness of the relationship between sleep paralysis and the Holmes-Rahe Social Readjustment Scale

scores in precare subjects ( $r=.398$ ;  $P < .01$ ), the panic attack-like symptoms that occur immediately after an episode of isolated sleep paralysis, and the hypothesized overaroused central adrenergic system<sup>6,7</sup> that is proposed to be the cause of both sleep paralysis and anxiety. In addition, a connection between stress and sleep paralysis is suggested from the finding that "combat fatigue" is the only social phenomenon associated with sleep paralysis.<sup>8</sup> Finally, the relationship of sleep paralysis and hypertension, both of which are proposed to be caused by an overaroused central adrenergic system, and the proposed heredofamilial trend that has been reported by other authors<sup>3,9</sup> were investigated.

## METHOD

In an effort to solicit subjects for the study, the Community Mental Health Council (CMHC), Chicago, mailed flyers to 962 people on its mailing list. They were asked to call CMHC to participate in a 10 to 15 minute confidential phone interview. The flyer contained a description of sleep paralysis and informed them that the object of the study was to get some answers to questions about sleep paralysis (eg, does it run in families; is it caused by stress; is it associated with high blood pressure). In addition, an article on the research project and the need for callers appeared in the *Chicago Defender*, a black newspaper. One of the authors (D.D.) made herself available for three weeks from noon to 4:30 PM, Monday through Friday, to accept phone calls from subjects and to fill out the scheduled interview. In addition to the call-in study, a family study was done by selecting a proband with isolated sleep paralysis and having every available family member take the structured interview on isolated sleep paralysis.

The structured interview developed by the authors provided the subject with a definition of sleep paralysis, collected demographic variables (ie, age, sex, ethnicity, occupation, annual income, marital status, education), and probed for a complete description of the subject's experience with the state. Once the callers gave the interviewer their phenomenologic report of their expe-

**TABLE 1. CAUSES AND CONTROL OF SLEEP PARALYSIS IN CALLERS**

	Yes	No	Do Not Know
<b>Causes</b>			
Self (ie, can you cause it?)	4	21	0
Other people or other situations	8	17	0
Stress	9	13	3
Irregular sleep habits	7	15	3
Heavy meal before sleeping	3	21	1
Drinking alcohol	2	21	2
<b>Control</b>			
Self (ie, can you end it?)	9	16	0
Others (ie, can others end your episode?)	4	21	0

rience with sleep paralysis, the interviewer determined whether further probing should take place. The interview included questions on control over the state, precipitating events (eg, stress, heavy meals), knowledge of folk medicine cures, and the intensity and nature of the subject's experience with the phenomenon. Whether subjects were comfortable or uncomfortable during an episode and whether sleep paralysis episodes got them into trouble were also asked. Finally, to probe the biological relationships and heredofamilial trends, subjects were asked questions regarding family histories of high blood pressure, panic attacks, mental illness, and sleep paralysis.

## RESULTS

### Callers

Twenty-five black subjects called in and were interviewed about their episodes of sleep paralysis. Their average age was 38.1, and they had about 15 years of education with an average income of \$19,480 a year. Nineteen subjects were female and six were male. Eleven were single, 12 were married, one was divorced, and one was widowed.

The responses catalogued in Table 1 were given to the general questions that were asked regarding the callers' episodes of isolated sleep paralysis.

With regard to voodoo and folk cures, 14 had heard that sleep paralysis was due to voodoo or a hex, and seven had heard of folk cures for sleep paralysis. In general most felt that they did not have control of this state. Only three felt they had control (for example, could have prevented episodes by following an antihypertensive diet, or could have brought oneself out of the state). Only three wanted to have it happen more often (primarily to try to figure out what was happening to them).

The questions regarding frequency and intensity provided the patterns seen in Table 2. Five of the 25 subjects no longer had sleep paralysis episodes. On the average, their episodes had not recurred in 5.4 years. Four of those five, when experiencing the state, experienced it only a few times in their lives and one had episodes weekly.

Nine subjects said it seemed they grew out of having episodes, 11 said they had not, and five were not sure. Only five of 25 subjects reported that they were comfortable during their episodes, and only four of 25 reported sleep paralysis had caused difficulties (mostly embarrassment or fearfulness about going back to sleep). Seven participants felt their episodes increased with age, 17 did not, and one did not know.

Responses to the questions designed to probe for biological and heredofamilial relationships showed that sleep paralysis ran in the families of seven of the subjects (three reported mother had it, one reported mother and an aunt had it, and one

TABLE 2. EPISODES OF SLEEP PARALYSIS

	Callers	Family Members with Sleep Paralysis	Total
Frequency			
Daily	1	2	3
Weekly	2	1	3
Monthly	8	5	13
Semi-annually	4	5	9
Yearly	0	3	3
Every 3 years	1	2	3
A few times in lifetime	4	9	13
Never anymore	5	6	11
Totals	25	33	58
Duration			
1 minute or less	5	7	12
1-3 minutes	6	2	8
3-5 minutes	2	4	6
10-15 minutes	1	1	2
15 minutes or longer	1	0	1
Do not know	10	19	29

each reported a sister, grandmother, or grandfather had it). Eight of 25 subjects (32 percent) reported having been diagnosed as having high blood pressure; five said that after treatment the frequency of their sleep paralysis stayed the same, two said the frequency of episodes decreased, and one was not sure whether there had been a change. Twenty-one of the 25 subjects reported hypertension ran in their families (84 percent). Twelve mothers, nine fathers, seven brothers, five sisters, three aunts, two uncles, five grandmothers, and one grandfather were reported as having hypertension. Six reported individuals in their families who had both sleep paralysis and hypertension (two reported their mothers were dually afflicted, two reported their fathers, one reported a sister and aunt, and one reported a grandmother). Twenty-one subjects reported they had never been treated for a mental illness or nervous condition, three reported treatment as outpatients, and one reported treatment as an inpatient.

The information gathered relating to panic attacks is especially interesting: nine subjects reported at least four of the 12 symptoms listed in DSM-III criteria<sup>10</sup> for panic attacks; two reported that they had once had weekly attacks (one subject stated that the attacks stopped a year ago, and

another stated that they had stopped 27 years ago); one reported attacks once daily; one reported weekly attacks; one reported attacks twice yearly; two reported yearly attacks; one reported having only one such attack in his life; and one did not respond to the question. Thus, four of 25 subjects (16 percent) had panic attacks frequently enough at some point in their lives to qualify for a diagnosis of panic disorder according to DSM-III criteria.

### Family Study

The family that was studied consisted of a proband whose grandmother and grandfather (first generation) both had sleep paralysis (Figure 1). The proband's grandparents had 13 offspring (six male and seven female); seven subjects (53.8 percent, three men and four women) reported having had sleep paralysis (second generation). The proband's mother, aunts, and uncles had 50 offspring (18 male and 32 female); 20 (40 percent, five men and 15 women) reported having sleep paralysis (third generation). The proband, her sisters, and cousins had nine offspring (three male and six female); five subjects (55.6 percent, two

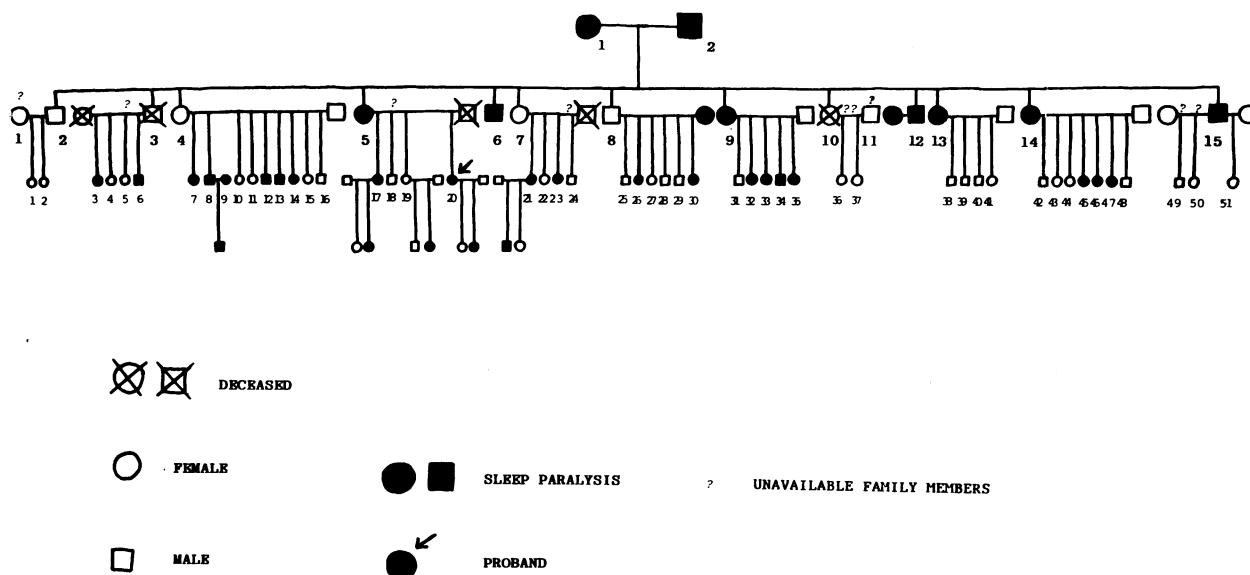


Figure 1. Family tree

men and three women) reported sleep paralysis (fourth generation).

Of the 64 family members who were interviewed, there was a total of 33 who reported having had at least one episode of sleep paralysis (51.6 percent). Their average age was 32.7, and they had about 13.2 years of education with an average income of \$13,495 a year. Twenty-two were female members and 11 were male. Fifteen subjects were single, 15 were married, two were divorced, and one was widowed. The average age of the 31 family members who denied ever having sleep paralysis was 29.7, and they had about 12.9 years of education with an average income of \$10,829 a year. Eighteen subjects were female and 13 were male. Fifteen members were single, 12 were married, and four were divorced.

The family members' responses to questions concerning frequency and intensity of their sleep paralysis episodes can be found in Table 2. Six members reported that the episodes had ceased, and on the average, the episodes had not recurred in 11.8 years. One of the six reported that the episodes had occurred monthly; one reported semi-annual occurrences; three reported it occurred only a few times in their lives; and one did

not respond to the question. The responses in Table 3 were given to the general questions that were asked regarding the family members' episodes of isolated sleep paralysis. Thirteen had heard of sleep paralysis being related to voodoo or hex and 20 had not. Only three reported that they had heard of folk cures for sleep paralysis.

Most felt that they did not have control of this state ( $n = 28$ ). Only two would like to have the episode more often. Fourteen subjects said it seemed they grew out of having episodes and 19 said they had not. Only three of 33 reported they were comfortable during their episodes, and only two of 33 reported sleep paralysis had caused difficulties. Nine felt their episodes increased with age compared with 24 who did not think so.

Eight of 33 subjects (24.2 percent) reported that they had been diagnosed as having high blood pressure; six said the frequency of their sleep paralysis stayed the same; and one said the frequency of episodes decreased following treatment. One subject was not sure. Since all of these subjects are related, it is apparent that hypertension runs in the family. Among the 64 family members (with and without sleep paralysis), 15 members reported having hypertension (23.4 percent) and

**TABLE 3. CAUSES AND CONTROL OF SLEEP PARALYSIS IN FAMILY MEMBERS**

	Yes	No	Do Not Know
<b>Causes</b>			
Self (ie, can you cause it?)	3	30	0
Other people or other situations	9	24	0
Stress	14	16	3
Irregular sleep habits	9	23	1
Heavy meal before sleeping	3	29	1
Drinking alcohol	3	30	0
<b>Control</b>			
Self (ie, can you end it?)	17	6	0
Others (ie, can others end your episode?)	13	20	0

eight reported having both sleep paralysis and hypertension (12.5 percent).

Sixty family members reported that they had never been treated for a mental illness, three reported treatment as outpatients (two of these had sleep paralysis), and one subject reported treatment as an inpatient (this subject did not have sleep paralysis). Twenty members (31 percent) reported symptoms of panic attacks (13 with sleep paralysis and seven without it). Of the seven subjects who did not have sleep paralysis, one reported he used to have panic attacks once monthly (the attacks stopped two years ago); one reported he was currently having panic attacks monthly; four reported panic attacks twice yearly; and one reported them once a year. Thus, due to the infrequency of the panic attacks, none of the 31 family members without sleep paralysis has ever qualified for a diagnosis of panic disorder as defined by DSM-III criteria.<sup>10</sup> Of the 13 subjects who have sleep paralysis, two reported they were having panic attacks once daily, three reported having panic attacks once weekly, three reported having panic attacks once monthly, two reported panic attacks, twice yearly, and three reported panic attacks once a year. Thus, five (15.2 percent) of the 33 family members who had sleep paralysis had panic attacks frequently enough to qualify for a diagnosis of panic disorder according to DSM-III criteria.<sup>10</sup> In all, five of the 64 family members (7.8 percent) qualified for a diagnosis of panic disorder at some point in their lives.

### Statistical Results

Callers with sleep paralysis and family members with sleep paralysis were not significantly different regarding the frequency with which they experienced episodes of sleep paralysis. This was determined by comparing the ratio of individuals in both groups who have one or more sleep paralysis episodes a month with individuals who have sleep paralysis episodes less often. Twelve of 25 callers (48 percent) and nine of the 33 family members (27.3 percent) reported having one or more sleep paralysis episodes per month and these subjects were designated as having sleep paralysis disorder. Thirteen of the 25 callers (52 percent) and 24 of the 33 family members (72.7 percent) reported having fewer than one episode of sleep paralysis a month and these subjects were designated as having sleep paralysis attacks. All of the subjects (callers and family members) who had sleep paralysis disorder were more likely to report that sleep paralysis was caused by stress than those who had sleep paralysis attacks, and the difference between the two groups in this regard was significant at the 0.5 level ( $\chi^2 = 3.98$ ;  $df = 1$ ). All of the subjects (callers and family members) who had sleep paralysis and panic attacks were also more likely to report that stress caused sleep paralysis than the subjects who had sleep paralysis but did not have panic attacks, and the difference between these two groups was significant at the .05 level ( $\chi^2 = 4.2$ ;  $df = 1$ ). All of the subjects (callers and family members) who had sleep paral-

ysis disorder were more likely to report that they had had panic attacks than those who had sleep paralysis less frequently, ie, those with sleep paralysis attacks, and the difference between these two groups was significant at the .05 level ( $\chi^2 = 5.2$ ;  $df = 1$ ).

Family members with sleep paralysis were more likely to report having had panic attacks than family members without sleep paralysis, and the difference between the two groups was significant at the .01 level ( $\chi^2 = 15.04$ ;  $df = 1$ ).

There was no significant difference between the callers, family members with sleep paralysis, and family members without sleep paralysis regarding their having hypertension.

## DISCUSSION

In the previous study<sup>1</sup> of 108 black subjects and patients, 27.3 percent had sleep paralysis disorder (one or more episodes of sleep paralysis per month). In the current study, 48 percent of the callers and 27.3 percent of the family members with sleep paralysis episodes are classified as having sleep paralysis disorder. Initially, the authors thought the callers may have been motivated to call because of the frequency of their sleep paralysis episodes, thereby accounting for the greater percentage of subjects with sleep paralysis disorders in the caller sample. Statistical analysis, however, discounts this explanation, as the ratio of sleep paralysis disorders to sleep paralysis attacks (less than one episode per month) was not significantly different in the three groups. Although the populations in the current study were not randomly sampled, it again appears that at least one fourth of the black population have the pattern of recurrence of isolated sleep paralysis that Hufford reports is the least common, "the individual who experiences the attacks frequently over a period of years."<sup>5</sup>

Another indication that the epidemiology of sleep paralysis is different in blacks is evident when comparing the prevalence of sleep paralysis in the two white families studied by Roth et al<sup>9</sup> and the black family in the current study. Specifically,

the two white families had 14 of 56 (25 percent) and four of 19 (21.1 percent) family members who experienced sleep paralysis compared with 33 of 64 (51.6 percent) members of the black family in the current study.

The low number of callers (25) responding to the large number of mailed flyers (962) might lead one to question the authors' hypothesis that sleep paralysis is more common among blacks. The authors reason that the low response to the request for research volunteers is similar to the explanation offered by Pierce<sup>11</sup> regarding the difficulty of getting black subjects to volunteer for research on hypertension. In the past, research findings have been interpreted in ways that have been damaging to blacks, and many blacks feel that when they volunteer for research they may run the risk of being involved in experimentation similar to the infamous Tuskegee experiment on the course of syphilis. These factors make blacks reluctant to volunteer for research, even if it is being done by blacks to benefit blacks. However, most callers reported they had responded because the article appeared in the *Chicago Defender*; so it seems that the answer to getting black research volunteers depends more on the presentation than the worth of the project.

The characteristics of sleep paralysis episodes were similar in both the callers and family members with sleep paralysis. There were, however, three times as many female as male subjects who had sleep paralysis episodes in the call-in group and twice as many women in the family members group. And at first glance, this was supportive of the observations of Roth et al<sup>9</sup> that the prevalence of sleep paralysis was greater in women, and contrary to the observations of Goode,<sup>3</sup> who found men outnumbered women 4:1. However, in considering that the callers did not constitute a random sample, that more females were born to the black family studied, and the difficulties involved in recruiting black men for research studies, the predominance of women in these two cohorts is not a significant indicator for the female sex being more at risk for having sleep paralysis. In fact, in the authors' previous work<sup>1</sup> with more randomly selected sample populations and in Hufford's work,<sup>5</sup> the percentages of men and women with sleep paralysis were approximately the same.

For both the callers and family members, sleep

paralysis seems to be a paroxysmal phenomenon in which the afflicted have little control over the inducement or termination of the episodes. In general, neither the callers nor family members with sleep paralysis felt it was caused by irregular sleeping habits, heavy meals, or drinking. Callers were nearly equally divided as to whether stress caused sleep paralysis. Of the family members with sleep paralysis, more (2:1) said that stress caused sleep paralysis. When the callers and the family members with sleep paralysis were divided into those with sleep paralysis disorder (more frequent episodes) vs sleep paralysis attacks (less frequent episodes), it became apparent that those with the most frequent episodes of sleep paralysis felt stress caused their episodes. This finding was consistent with the preliminary findings in the previous study<sup>1</sup> that sleep paralysis and stress may be correlated.

As with the callers, one half of the family members with sleep paralysis had heard of supernatural causes of sleep paralysis; while one third of the callers had heard of folk cures, less than 10 percent of the family members with sleep paralysis had heard of such cures. Hyatt<sup>12</sup> reports folklore cures, such as: putting a Bible under the head of the bed, catching "the hag" in a bottle, laying a broom at your door, putting a fork under your pillow, tying horsehair on your wrist, putting a horseshoe over your door, saying "Lord, have mercy," putting mustard seeds on the floor, putting red pepper on the floor, putting salt on the floor, and using a sifter in various places. Hufford notes similar folklore cures in his book on the subject, and the subjects of the current study had knowledge of folk cures similar to those outlined by Hyatt. Since the body of black folk medicine includes cures for sleep paralysis (also known as "the witch is riding you") and blacks may be more afflicted with sleep paralysis than whites, questions regarding the prevalence of sleep paralysis in blacks in Africa and the availability of African folk medicine cures arise. Further, if there are similar phenomena in Africa, is there any relationship between the two, ie, are Afro-American folk cures for sleep paralysis cultural vestiges of African folk cures for sleep paralysis?

The majority of subjects with sleep paralysis (callers and family members) do not wish for recurrences, and most feel uncomfortable during

their episodes. This is most likely due to the panic attack-like symptoms that are experienced after the paralysis ceases. The callers and family members were also similar in that there seemed to be two divergent groups of sleep paralysis victims, one who said the frequency of their sleep paralysis episodes decreased with age and one who said the frequency of their sleep paralysis episodes increased with age. The meaning of this finding remains unclear and will take further study to unravel.

Thirty-two percent of the callers reported having hypertension, and 84 percent reported hypertension ran in their families. Family members with sleep paralysis reported having hypertension at a rate of 24.2 percent, which was nearly identical to the family members without sleep paralysis with a rate of 22.6 percent. Since 11 family members were under the age of 20 years (five with sleep paralysis and six without it), the prevalence may increase as these younger members get older. Twenty-four percent of the callers reported family members with both hypertension and sleep paralysis. Of the black family members studied, 12½ percent actually had sleep paralysis and hypertension. Unfortunately, this information does not shed much light on the possible connection between sleep paralysis and hypertension. The range of the prevalence of hypertension in blacks is from 18 to 37 percent,<sup>13</sup> so neither the callers nor family members with sleep paralysis had a greater than average prevalence of hypertension.

Yet, the relationship between hypertension and sleep paralysis cannot be excluded. Perhaps a better method of studying this relationship would be to look at the prevalence of sleep paralysis in hypertensives vs normotensives. Similarly, there were not enough subjects with sleep paralysis who had been treated for hypertension to determine whether there was a concomitant decrease in sleep paralysis episodes with a treatment designed to reduce hypertension via central nervous system neurotransmitter alterations. Such a finding would support the hypothesis that an overaroused central adrenergic system is a significant factor in the development of both sleep paralysis and hypertension. Again, it may be better to study this relationship by looking at hypertensive subjects with sleep paralysis to see whether antihypertensive medication (that acts via central nervous system neuro-



transmitter alteration) reduces the frequency of their sleep paralysis as well as controls their blood pressure.

Family members with sleep paralysis were more likely to report having had panic attacks than family members without sleep paralysis, and the difference between these two groups was statistically significant. Sixteen percent of the callers and 15.2 percent of the family members with sleep paralysis reported having panic attacks frequently enough to have been diagnosed as having panic disorder. Significantly, none of the family members without sleep paralysis reported having panic attacks frequently enough to have been diagnosed as having panic disorder. The morbidity risk for developing panic disorder in the black family studied was 7.8 percent. These percentages are much higher than those reported for the general population. Anxiety disorders in the general population have a prevalence between 2 to 5 percent.<sup>14</sup> Weissman et al<sup>15</sup> reported generalized anxiety disorder had a prevalence of 2.5 percent; panic disorders, 0.4 percent; and simple phobias, 1.4 percent for a total prevalence of about 4.3 percent using DSM-III criteria. Uhlenhuth et al<sup>16</sup> found the prevalence of agoraphobia and panic disorder was 1.2 percent; for other phobias, 2.3 percent; and for generalized anxiety disorder, 6.4 percent. Thus, it appears that subjects with isolated sleep paralysis may be more at risk for developing panic disorder than individuals in the general population, and the two syndromes may be different clinical manifestations of the same disorder. Certainly, subjects report panic-attack symptoms during and following an episode of sleep paralysis.

It is the authors' clinical experience that patients with panic disorder who also report episodes of isolated sleep paralysis note a concomitant decrease in panic attacks and sleep paralysis episodes when treated with antidepressant medication. Additional support of a relationship between sleep paralysis and panic disorder comes from the finding that subjects with sleep paralysis disorder (both callers and family members) were more likely to report they had panic attacks than those who had sleep paralysis less frequently. Clinical experience with patients who have depressive disorders and who also report either panic attacks and sleep paralysis episodes or sleep paralysis episodes alone also reveals that treatment with

antidepressant medication relieves symptoms of all three.

Family studies of probands who have panic disorders reveal that the morbidity risk of first-degree relatives (parents and siblings) for developing panic disorder is several times higher than in control subjects who do not suffer from panic disorders. Noyes et al<sup>17</sup> found morbidity risks for first-degree relatives of patients with anxiety neurosis (panic disorder) was 19.1 percent. Crowe et al<sup>18</sup> found morbidity risks for first-degree relatives of probands with panic disorder was 17.3 percent, but only 1.8 percent for the first-degree relatives of normal control subjects. Harris et al<sup>19</sup> found morbidity risks for panic disorder was 20.5 percent compared with only 4.2 percent in first-degree relatives of normal control subjects. Pauls et al<sup>20</sup> found the morbidity risks for second-degree relatives (grandparents, aunts, and uncles) of patients with anxiety neurosis (panic disorder) was 9.5 percent, but only 1.4 percent for the second-degree relatives of controls.

In the black family studied in this paper, 33 percent of the proband's second-degree relatives with sleep paralysis also had panic attacks (5 of 15). This raises the question of whether, in addition to sleep paralysis and panic disorder being different clinical manifestations of the same disorder, the inheritability of sleep paralysis is the same as panic disorder. Certainly the black family under study here has a prevalence of panic disorder similar to the pattern of prevalence of panic disorders in families in which panic disorders seem to run. Since the age of risk for the development of panic disorders is 20 years, the prevalence of panic disorders in the black family studied may be underestimated as eleven of the family members were under the age of 20 years (five with sleep paralysis and six without). More family studies need to be done to verify this hypothesis.

Sleep paralysis is traditionally thought of as a component of the narcolepsy tetrad of sleep attacks, cataplexy, sleep paralysis, and hypnogenic hallucinations. However, sleep paralysis may occur as an isolated entity and not in association with narcolepsy or cataplexy. A more thorough review of the literature on isolated sleep paralysis and its relationship to narcolepsy was presented elsewhere<sup>1</sup> and will not be presented here. New information that is pertinent to the discussion of

isolated sleep paralysis in blacks will, however, be presented. First, it has been noted by sleep-disorder researchers that blacks are more predisposed to developing narcolepsy than whites. Narcolepsy is thought to be a hereditary affection transferred in an autosomally dominant manner, and it may be that isolated sleep paralysis and narcolepsy are manifestations of varying penetrance of the same hereditary disorder. In view of the previous discussion suggesting that sleep paralysis and panic disorder may be different clinical manifestations of the same disorder, another new interesting finding is that electroencephalographic patterns are similar in patients with panic disorder and narcolepsy, which suggests a common electrocortical etiology.<sup>21</sup> These findings do not lend support to the Roth et al<sup>9</sup> hypothesis that sleep paralysis is an independent nosologic and genetic entity that is separate from narcolepsy.

Roth et al<sup>9</sup> reported that in the two white families they studied the malady of sleep paralysis was invariably transmitted to the children by their mother. Mothers in their study transferred the disease to 56.2 percent and 43.8 percent of their daughters and sons, respectively. They did not find a single case in which the affliction had been transmitted by a man. Thus, they assert this pattern fits the mode of genetic transmission when the pathologic gene is dominant and on the X chromosome, ie, one half the children (both male and female) of the affected mothers would be affected, and the affected men would transmit the disease to all of their daughters but to none of their sons. The results of the black family study for sleep paralysis were not definite enough to assert whether the genetic predisposition for the development of sleep paralysis was autosomal dominant, with mixed penetrance (as in narcolepsy) or X-linked dominant as suggested by Roth et al,<sup>9</sup> because the afflicted men in the study had a small number of offspring and these offspring were not available for interview. It is clear that there is a dominant pathologic gene involved, and more black family studies will need to be done to assert whether the gene is on an autosomal or X-linked chromosome. Despite the likelihood of sleep paralysis being transmitted by a dominant gene, two thirds of the callers did not think sleep paralysis ran in their families. Such a mode of genetic transmission implies that the callers' family members may well

have had sleep paralysis, but never discussed the problem (possibly due to a general tendency in blacks to avoid any discussion of any problems that might indicate a nervous condition). In fact many subjects with sleep paralysis remarked they never discussed their experiences with others for fear they would be viewed as "crazy."

Ettedgui and Bridges<sup>22</sup> note that a significant percentage of patients with post-traumatic stress disorder experience panic attacks. Burstein<sup>23</sup> and Falcon et al<sup>24</sup> make similar observations, and go on to point out that antidepressant medication is useful in alleviating the symptoms of post-traumatic stress disorder. Burstein<sup>23</sup> hypothesized that the arousal-prevention action of the antidepressant medication relieved the post-traumatic stress syndrome patients of their dream disturbances, which were of a REM anxiety nature. Falcon et al<sup>24</sup> also hypothesized that post-traumatic stress disorder may be a term referring to a "heterogeneous group of patients suffering from various other tricyclic-responsive syndromes, especially panic disorder or major depressive disorder."<sup>24</sup> The proposed relationships between post-traumatic stress disorder and panic disorders, the finding that the only social phenomenon associated with sleep paralysis was "combat fatigue,"<sup>8</sup> the use of tricyclics to treat sleep paralysis<sup>25-28</sup> and post-traumatic stress disorder, and the finding that the subjects (callers and family members) who had sleep paralysis and panic attacks were more likely to report stress caused sleep paralysis than the subjects who had sleep paralysis without panic attacks all point to a possible connection between sleep paralysis and post-traumatic stress disorders. These factors, plus the similar proposed etiologies of an abnormal hypersensitivity of the central adrenergic nervous system in both post-traumatic stress disorder<sup>29</sup> and sleep paralysis, indicate the need to investigate the prevalence of isolated sleep paralysis in patients with post-traumatic stress disorder.

## CONCLUSIONS

Isolated sleep paralysis is more common in black subjects, and black subjects with sleep

paralysis are more predisposed to having the least common pattern of reoccurrence, ie, one or more episodes a month over a period of years. Because isolated sleep paralysis is a tricyclic-responsive syndrome and has features similar to panic disorder, it is strongly suspected that the two syndromes are different clinical manifestations of the same disorder. In addition, as with panic disorder, isolated sleep paralysis can be shown to have a genetic component to its etiology, and the genetic locus for the two syndromes may be the same which also implies different manifestations of the same disorder.

The syndrome of isolated sleep paralysis in blacks appears to be due to genetic factors with varying penetrance and to environmental factors of stress. Whether isolated sleep paralysis can be conclusively shown to be due to an overaroused central adrenergic system (that was at risk due to a genetic and stressful environmental predisposition) that is also related to the common and more severe disease of hypertension in blacks remains to be seen. Genuine, ethical research on blacks regarding these issues may well answer some long unanswered questions about stress, anxiety, and psychophysiological disorders for mankind in general. It may also provide grounds for scientific discourse with black Africa.

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